THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. OCTOBER 8, 1896. CHICAGO, ILL. NUMBER 41

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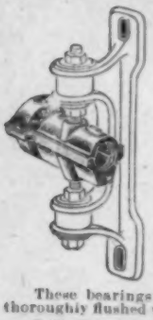

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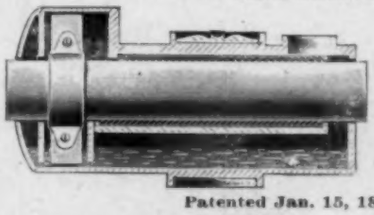

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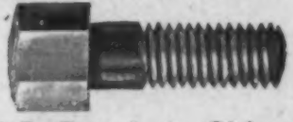

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Chemist and Metallurgist

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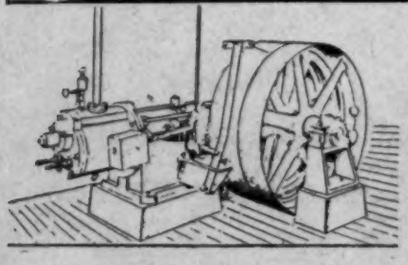

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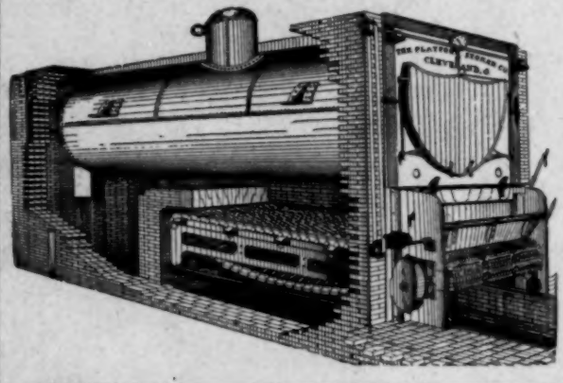

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. OCTOBER 8, 1896 CHICAGO, ILL. NUMBER 41

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Those who have looked for a steady increase week after week in sales of iron and steel, in consequence of the better feeling that has prevailed for three or four weeks, have been disappointed. It has been made plain that the simultaneous resumption of a number of mills two or three weeks ago was but a coincidence. Some whose starting up was widely heralded as a sign of revival are shutting down now, to await the accumulation of further orders, showing that buyers in general are taking hold just as their needs require. And if details were given of some of the so-called season contracts that have been heard of lately, it would appear that they largely hinge on business developments, some being in effect buyers' options. The past week has probably come up to those immediately preceding it, in the amount of business closed, both for pig iron and finished material. Southern furnaces are maintaining their recent advances and on soft irons, which are found to be scarce, more money has been asked in the past week. The present Birmingham quotation is $7.25 for No. 2 foundry and No. 1 soft, or 85 cents above the basis of the speculative sales of the former in August. There is larger buying of foundry iron in the East than in other sections, though the Central West in the past few days has given evidence of more activity. For deliveries in the first half of 1897, sellers hold for 25 to 50 cents above the basis for the balance of this year. Some 1,000-ton and 2,000-ton sales both in Northern and Southern iron have been made to consumers who wanted to insure themselves against a possible advance in the next six months. This speculative feature is indicative of confidence in better conditions after the elections. There has been less activity in Bessemer iron than in the preceding week. Offers of $10.85 at valley furnace, with an additional 15 cents for storage until 1897, have been made by speculative buyers, but little interest in such deals is shown by the average furnaceman. Steel is dull and in spite of recent detached conferences of prominent members of the billet pool, it is known that an advance in price has not been under discussion. In finished materia concerned there are few mills that have felt what they would be willing to call a real revival in demand. Bridge work has probably been the most encouraging feature, and some little figuring is being done east and west. Agricultural implement buyers seem to regard this the time to make season contracts. A moderate tonnage has been closed, with considerably more in the inquiry stage. Mills that want to tide over the next few weeks without a complete shut-down have been making low prices on early shipments and plates, bars and angles are at the lowest figures of the year.

THE CLEVELAND DISTRICT.

The amount of iron ore shipments continues to excite surprise in the trade, in view of the untoward conditions that have operated from the very beginning of the season. It is evident that quite a little ore is being brought down on the chance of doing business from the docks before spring opens. Up to Oct. 1 the total shipped from upper lake ports, as reported to the iron ore association was 8,276,092 gross tons, indicating a movement of about 1,272,000 tons in September. The total to Oct. 1 1895, was 8,105,212 gross tons, or 170,880 tons below this year's record. We continue to hear of sales of non-Bessemer ores, with only a small movement in Bessemers. The possibilities of an ore movement above 9,000,000 tons, making 1896 second only to last year, are being discussed.

Pig Iron. There has been more inquiry for iron by foundrymen in the Cleveland district and tributary territory the past week, than in many weeks preceding, and some of the inquiries have resulted in business. A recent Northern Ohio sale on agricultural account amounted to 4,000 tons, 2,000 tons Northern and 2,000 tons Southern, deliveries extending over a year, on four months paper. It is understood that the buyer can stop at any amount below the maximum stated above. On business running into 1897 sellers are getting an advance over today's prices, ranging from 25 to 50 cents. With most furnaces $10.50 in the valley, or $11.15, Cleveland, is asked on No. 2, deliveries through the balance of the year, but this is shaded. There is nothing doing in Bessemer iron, though furnacemen continue to have bids from speculators. Northern gray forge is growing scarce, but there is no special demand. In Lake Superior charcoal some fair sales have been made, recent transactions in this district amounting to 5,000 tons. We quote Cleveland prices:

Bessemer	$11 50@11 75	Valley Scotch No. 1	$11 75
No. 1 Strong Foundry	11 50@11 75	Valley Scotch No. 2	11 25
No. 2 Strong Foundry	11 00@11 25	Gray Forge	9 60@ 9 75
No. 3 Foundry	10 50@10 75	Lake Superior Charcoal	13 50

Finished Material Bridge building is looking up. A sale of 2,000 tons of bridge material was made last week. Several sales of 150 to 200 tons in various lines of finished material are also reported. A Central Ohio agricultural concern is in the market for season requirements and there is figuring also on smaller lots. A sale of ingots has been made locally; but in billets there is no activity. The bar iron association met this week in St. Louis, but the social side of the meeting dominated. No change was made in prices. It is reported that some concessions have been made by some mills, to meet the competition of steel bars at 1c to 1.05c, Pittsburgh. On the whole the volume of business is larger than in the few preceding weeks and the outlook is more encouraging. A 3,000-ton ship plate inquiry is being figured on, but it is not certain that anything will be done. We quote: Beams and channels, 1.65c; bar iron, 1.15c to 1.20c; steel bars, 1.10c to 1.15c; plates, 1.20c.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, Oct. 7.

Generally speaking, conditions are about the same as they were a week ago. No notable transactions have taken place in any branch of the iron and steel trade but a very good volume of business has been done and buyers are continually coming into the market for enough to keep up the average. Consumers of iron and steel are apparently gaining confidence all the time and the indications are that business will be considerably increased shortly after the election.

PIG IRON.—Buying keeps up very well, last week showing a considerable increase over the week before. The sales include some round lots of both Northern and Southern irons, and a large number of small orders ranging from carload to 100 and 200 tons. Prices are quite a little firmer than they were a week ago and those on Southern irons have been advanced 25 cents a ton to $10.90 for No. 2 foundry. One furnace is asking an advance of 25c over these figures, or $11.15 for No. 2 foundry. Some sales of both Northern and Southern irons have been made for delivery in the first six months of next year, but the furnaces are not anxious for this business and are asking 25c to 50c a ton advance on it. Quotations are as follows

Lake Sup. Charcoal	$13 50@14 00	Southern No. 2 Soft	$10 65@10 90
Local Coke Fdy. No. 1	11 25@11 75	South'n Silveries No. 1	11 15@11 65
Local Coke Fdy. No. 2	10 75@11 25	South'n Silveries No 2	10 90@11 15
Local Coke Fdy. No. 3	10 25@10 75	Jackson Co. Silveries	14 00@16 05
Local Scotch Fdy. No. 1	11 25@11 75	Ohio Silveries No. 1	15 00@15 55
Local Scotch Fdy. No. 2	10 75@11 25	Ohio Silveries No 2	14 50@15 05
Local Scotch Fdy. No. 3	10 25@10 75	Ohio Strong Soften ts	14 00@14 28
South'n Coke No. 1	11 15@11 40	Alabama Car Wheel	16 25@16 75
South'n Coke No. 2	10 90@11 15	Malleable Bessemer	12 25@12 05
South'n Coke No. 3	10 65@10 90	Coke Bessemer	13 00@13 50
Southern No. 1 Soft	10 90@11 15		

BAR IRON.—There has been a considerable demand in the past week and several good sized sales have been made. Agricultural implement makers have asked for prices in the past week and one or two contracts have been secured from this source. Prices are as follows Common iron, 1.30c to 1.35c; guaranteed, 1.35c to 1.40c; soft steel bars from strictly billet stock, 1.20c to 1.25c.

RAILS AND TRACK SUPPLIES. — There is no business in sight except small orders, but a fair run of these is had. There is some talk of shutting down the South Works of the local company within the next two or three weeks. Prices are made as follows Rails, $29; splice bars, 1.30c to 1.35c; track bolts with square nuts, 1.90c to 2c; hexagon nuts, 2c to 2.10c; spikes, 1.75c to 1.80c.

BILLETS AND RODS.—No sales of either billets or rods were made last week but some good inquiries have been received for billets which will probably develop into orders within a short time. Quotations are unchanged at $26.50 for rods and $21.25 for billets.

STRUCTURAL MATERIAL.—A contract for 500 tons of bridge material was given out by the C. M. & St. P. Road last week. There are several projects on the boards but it is not probable that any of them will be closed until after election. Prices are unchanged as follows: Beams and channels, 1.70c to 1.75c; angles, 1.25c to 1.30c; plates, 1.30c to 1.40c; tees, 1.45c to 1.50c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—The market has been very quiet and the only orders closed were for small lots. Better business is expected in November. Quotations are made: Tank steel, 1.30c to 1.35c; flange steel, 1.55c to 1.60c; fire-box steel, 2.15c to 5c.

SHEETS.—Business is limited to small orders and the prospects for an increase in the demand are not good for the next two or three weeks. Quotations are made at 2.15c to 2.20c for No. 27 black and 80 and 2½ to 80 and 5 per cent discount for galvanized.

MERCHANT STEEL.—The market is in somewhat better condition than it has been lately as inquiries and orders are both larger and more plentiful. Some of the business in sight will undoubtedly be held until November, but the current orders are very good. Prices are as follows: Open-hearth spring, tire and machinery steel, 1.85c to 1.95c; smooth finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.55c to 1.65c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD RAILS AND WHEELS.—No business has been done except in old steel rails and only a few of these have changed hands. Prices are only nominal. Old iron rails are held at about $11 to $12, old steel rails at $7 and old wheels at $11 to $12.50.

SCRAP.—The market is very quiet, almost no sales being made. The following are buying quotations furnished by dealers: Railroad forge, $8.50 to $9; dealers' forge, $8 to $8.50; No. 1, mill, $6; heavy cast, gross ton, $7 to $7.50; malleable cast, $7.75 to $8.25; axles, $11.25; cast borings, $2.75; wrought turnings, $3.25; axle turnings, $5.25; mixed steel, $6.25; stove plates, $5.25; heavy melting steel, $7.75 to $8.25.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Oct. 7.

While returning confidence in the iron trade has increased during the week under review, yet the activity recorded for the week preceding has not been equaled. It is conceded that no considerable change can be felt until all political uncertainty is removed. The week can be summarized in a decline in sales of iron, accompanied by a stiffening in quoted rates. Some finished lines, notably bars, sheets and wrought pipe, show some improvement. Enlarged inquiry is reported in nearly all lines

PIG IRON.—The transactions of the week just closed have strengthened the opinions of furnacement that no general demand for their product will appear before the uncertainties about election disappear. In the face of a firmer stand by producers, buyers have chosen to take risks and defer buying. Hence there is nothing like a movement in iron. The stronger tone has been well maintained and furnacemen are naming no low figures unless forced by money conditions to realize. To-day $11 in the valley is the minimum quoted and higher figures have been named. On the other hand $10.75 has been taken and $10.50 is reported. A better movement in gray forge and foundry iron is noticed in some quarters but is by no means general. The largest transaction of the week was 6,500 tons of washed iron sold by a local broker. Other transactions were small. We quote:

Bessemer	$11.50 to $11.75
No. 1 Foundry	11.50 to 11.75
No. 2 Foundry	11.00 to 11.25
No 3 Foundry	10.50 to 10.75
Gray Forge	9.60 to 9.75

BILLETS.—Very little is being used and billets are consequently a small factor in the market. Some cheap steel, secured by exchanging old sizes, is offered a few cents below pool rates. Activity in tin plate bars continues, as well as a fair demand for sheet bars, for which pool rates must be paid. The only considerable sale of the week was a lot of 3,000 tons at pool price.

STRUCTURAL MATERIAL.—Some bridge work is up and produces sharp competition. Pittsburgh mills are watching the capitol at St. Paul and the Detroit county building, both of which are let this week. Angles are reported weak at 1.15. The giving of estimates continues, but results in little work just now. We quote: Beams and channels, 1.55c; universal plates, 1.15c to 1.20c; angles, 1.15c; zees, 1.30c to 1.40c; tees, 1.30c to 1.40c.

BARS.—Several agricultural concerns made yearly contracts during the week and some buying for present use has taken place. Inquiries are quite numerous just now and represent largely present requirements, although some running contracts are included. Some extremely low prices are prevailing on large orders but the market is by no means demoralized. We quote: Best muck bar iron, 1.20c to 1.25c; common, 1.10c to 1.15c; Youngstown and Cleveland, 1.20c; steel bars, 1.05c to 1.10c.

WROUGHT PIPE.—The merchant trade has developed some life during the week and the requirements are of fair proportions. The purchases are recognized as for immediate needs alone and indicate no disposition to stock up. Larger sizes are in more demand. Five 10's and 5 per cent is quoted.

PLATES.—The inroad on prices continues and the small business placed scarcely repays the mill for the labor spent in securing it. No betterment is looked for immediately, as requirements are small and nearly all mills lightly booked ahead. We quote: Tank, 1.15c to 1.20c; shell, 1.25c to 1.30c; flange, 1.35c to 1.40c.

SHEETS.—Some business is in sight and a considerable tonnage has been placed in the last few days. A large proportion of the many inquiries result in nothing, but some wants are being covered. No. 28 guage has been in particular demand. Prices are slightly better. We quote: No. 26, 2c; No. 27, 2.05c to 2.10c; No. 28, 2.15c to 2.20c. Galvanized are fairly active at 80 and 2½ per cent off.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. There has been broadening of the current of trade, and interest in pig iron is becoming more general. Southern brands have commanded most of the attention, although numerous orders have been placed for Ohio irons. The furnace companies are refraining from any artificial forcing of advances. There is no combination in the South, but each company is making quotations based on the condition of its order books and stocks on hand. When it is found that any grade is heavily sold ahead, agents are instructed to quote only at a higher figure. There is no weakness anywhere, but prices are irregular, some holding certain grades 25 to 50 cents per ton higher than others. Investors have apparently dropped out, and the demand now is from actual consumers who are buying to cover probable wants for longest deliveries obtainable. Every one apparently believes in a high range of values at some time during the next six months, and producers are unwilling to fill their books with orders, even at present quotations. Several Lake Superior charcoal deals of importance are under way, and a few sales of Southern charcoal have been made. In spite of small consumption of iron, it looks now as if the buying movement is gathering force. A number of sales of iron—1,000 to 2,000 tons each—have been made through local offices. Some No. 2 foundry has sold at $7.15, Birmingham, and it is reported that some can be had at $7 conditionally. No 1 foundry is quoted at $8 and one furnace company has put its figure at $8.25. Soft irons are scarce, and for No. 2 soft $7.25 is asked but it has not been obtained. No sales of No. 2 soft have been reported as high as $7 in Birmingham but furnaces are insisting on this price, because of its scarcity. Cincinnati quotations are as follows: Southern Coke, No. 1 foundry, $10.50; No. 2, $9.75 to $10; No. 3, $9.50; gray forge, $9 to $9.25; mottled, $9 to $9.25; No. 1 soft, $9.75 to $10; No. 2, $9.75 to $10; Lake Superior coke, No. 1, $12 to $12.50; No. 2, $11.50 to $12.

Philadelphia The same general statements are made about the market as in the preceding week: That there is an improvement in pig iron, in price and demand, and that as regards finished material, all the mills are in need of work and are quoting low figures to secure business. The largest recent transaction in the Eastern market was in heavy steel scrap. It is reported that in addition to the 15,000 tons of crop ends from the Chicago district sold recently in Pittsburgh at $10.50 delivered, a sale of 12,000 tons of the same material was made for shipment to a basic steel works in Germany. The price is not definitely stated, but is believed to be close to $10.50 at seaboard. The pig iron inquiries in the past ten days have been for Southern foundry, for basic iron and for LakeSuperior charcoal. There is more inquiry for Northern grades in view of the late advances in Southern. Sellers have been asking 25 to 50 cents advance on deliveries running three or four months into 1897, but there is no great volume of such business, the bulk of the buying being for delivery this year at about 15 cents advance over the old prices. We quote seaboard prices as follows: No. 1 X foundry, $12.50 to $12.75; No. 2 X foundry, $11.75 to $12; No. 2 X Southern, $11.35 to $11.50; No. 2 plain, $11.25 to $11.50; standard gray forge, $10.75 to $11; ordinary gray forge, $10.35 to $10.50. In finished material perhaps bridge work gives the best promise of demand, but there continues to be hesitancy in all departments. A small-lot business is going and prices are irregular with concessions made where mills are anxious to get enough tonnage to bunch with orders already taken and make a run of a week or so. There is a great effort to keep up a measure of activity even at some sacrifice, in the next few weeks, the belief being general that orders will be freer after Nov. 3. We continue quotations: Refined bar iron, 1.20c to 1.25c; steel bars, 1.20c to 1.30c; plates, 1.35c to 1.40c; angles, 1.30c to 1.40c; beams, 1.70c to 1.90c.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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THE PITTSBURG DISTRICT AND LAKE SHORE.

It is a significant statement of Mr. Carnegie in the article quoted in these columns last week, that the new line from Lake Erie to Pittsburgh, in which he is interested, expects to make its investment pay on a basis of 3 mills per ton-mile, or, say, 45 cents for hauling a ton of ore from lake docks to furnaces. Such a rate would go far to remove the handicap that has been accumulating against the Pittsburgh district by reason of the practically stationary rail freights on ore, while lake freights have been steadily decreasing. This has made the cost of getting ore from Lake Erie to Pittsburgh an increasingly larger proportion of the total freight from the Lake Superior district to Pittsburgh furnaces. The new road will plainly secure to the one interest identified with it an advantage over other producers in the Pittsburgh district, since it is not expected that other roads engaging in passenger and mixed freight traffic can make so low a rate. And so far as the Carnegie Steel Co. is concerned, it would command a cost of assembling materials very close to the figure possible to a plant on the south shore of Lake Erie. There is to be considered this fact, however: the possibilities of making the lake haul on ore still smaller in comparison with the rail haul from Lake Erie to Pittsburgh are far from being exhausted. So far as the economies of transportation by rail are concerned, it does not appear that like progress is being made or is likely to be made toward cheapness. The day of the electric locomotive may bring economies not known now, but that is too remote for present consideration.

The freight rates that have prevailed on the lakes this year are more significant of the evolution that is going on in the cost of water transportation than the developments of any other single season. The greater portion of the ore brought down on wild charters this season has been at 60 cents from the head of the lake, 50 cents from Marquette and 40 cents from Escanaba. Last season's average of wild charters was $1.13 from Ashland, 92 cents from Marquette and 73 cents from Escanaba. For the 10 years preceding 1896 the average of wild charters was $1.30 from Ashland, $1.12 from Marquette and 91.5 cents from Escanaba. Concerning the rates given for last season it will doubtless be said that the competition for grain tonnage in the closing months of the season brought ore freights up to an abnormal height. This is true, but it is to be considered also that only a small proportion of the ore carried last season paid these high rates.

The influence of the rapid increase in the number of 4,000-ton freighters (most of them capable of 5,000 to 6,000 tons with 20 feet of water) is made more apparent when it is said that the low rates of the present season have not been due to a lessened movement of freight. Taking the Lake Superior traffic as a criterion, as indicated by the figures from the Sault Canal, it appears that a volume of business large beyond precedent has attended a freight average low beyond precedent. While the total freight through the Sault Canal to Oct. 1 last year was 10,678,959 net tons, or nearly 2,000,000 net tons beyond 1895, to Oct. 1, and 4,000,000 net tons beyond 1894 to the same date, the movement this year, with a considerable fraction of lake tonnage tied up for a part of the season, reached the enormous total of 12,793,441 net tons. Without going into detail farther, it is correct to say, speaking broadly, that within a year a sharp and permanent decline has taken place in average lake freights and that the prospect is rather for a continuance of the low basis or for further economies, than the contrary. There is no present prospect, moreover, that the rail rate to Pittsburgh on lines uncontrolled by producers and not devoted exclusively to mineral traffic, can be reduced to keep pace with the rate of the reduction of lake freights on ore. The excess of advantage in this particular, therefore, will continue to remain with the lake shore plant that has no rail haul on raw material except coke.

Some of the comments that have been made on Mr. Carnegie's article have taken no account of the effect of probable extensions of retort coke manufacture. Important among the advantages of the Pittsburgh district is proximity to the Connellsville region. As has been stated frequently in the discussion of the subject, other districts, by the use of the by-product process, can employ local coals in part, at least, and thus come more nearly to a par with Pittsburgh in the matter of fuel cost. In the case of the leading producer in the Pittsburgh district, its advantages of cheap transportation, in having an ore road of its own, may yet be needed to offset its strong committal to the bee-hive oven. Investments of millions will not lightly be abandoned and it may be expected that bee-hive coke will be the fuel of imporant interests in the Pittsburgh district for some years to come.

A STEEL company sells a quantity of rods to a wire nail mill which has its own rod mill. Concluding that it will let out the conversion of billets into rods, for this order, instead of operating its own rod mill, the steel company contracts with the wire nail company in question to make the rods in the latter's mill. The trans-

action is perfectly regular and the price to be paid for conversion is properly a matter of agreement between the two companies. As the steel company has entered the transaction on its books as a sale of rods, it cannot be required to report it to the billet pool commissioner. However, it readily can be seen that the integrity of the pool price for steel might be jeopardized by the multiplication of transactions of this sort. Yet the possibilities of this method are apparently limited to an intermediate product like rods. It is not supposable that it could extend to steel bars, since there is no form of material a rolling mill would regularly buy from a steel company, outside of billets.

RECENT articles in the daily press have had much to say about impending developments in iron and steel manufacture. A recent conference in New York and a later one in Chicago, the latter attended by the officers of leading steel companies, have revived a great deal of misinformation about Mr. Rockefeller's plans. Mr. Rockefeller is not in the habit of talking for publication, nor are the gentlemen who have most to do with carrying out his plans. Moreover, he is not in the habit of being anticipated in what he does, by newspaper articles. It can be said, concerning the Chicago meeting, that neither Mr. Rockefeller's "steel trust" nor his "blast furnace trust" nor any other imaginary or real phase of his connection with the iron trade was under discussion, and that the matters taken up pertained to business relations of the two companies represented. Neither the price of billets nor the price of rails is liable to be charged at an early date; and there is nothing in the situation to suggest the necessity of considering such changes.

IN commenting on our remark that "men who had worked in English mills at one-half the wage they received in this country were able to speak with some assurance in protesting to the Wilson committee against some of the reductions proposed in the iron and steel schedule," the London *Iron and Coal Trades Review*, says: "Our contemporary fails (as is usually the case) to point out the great difference in the relative purchasing power of money in America and Great Britain." There is a difference we concede; but so far as statistics and statements of experience can establish the relative advantages of living in the two countries, we have found that iron workers invariably concede a large preponderance in favor of the United States. If the test be made on the amount the thrifty man is able to save after his wants have been supplied, it will invariably be in favor of this country. The homes owned and the home comforts enjoyed by the iron workers of the United States tell the story. And as for labor in general, it is sufficient to say that those who have tried both conditions are still found on this side of the water. As President Harrison put it: "the gates of Castle Garden swing ever inward."

THE Welsh tin plate works have decided to ask for return to the higher scale of wages known as the "1874 list," and if this demand is not complied with in the present week they are expected to go out on strike. The result of a curtailment of production or of an advance in wages would in either event be a stiffening of the price of foreign plates in New York. It is estimated that the consumption of tin plates in the past season of canning has been 30 to 40 per cent below that of a normal season, and there has been such competition among home producers that the price of domestic tin plates has continued to range below that of the foreign product. Some better basis must yet be arrived at before there will again be a profit for American tin plate manufacturers.

THE wire nail pool made no change in prices nor did it restore the guarantee at last week's meeting. A non-pool concern at Chicago has been making some inroad on prices in that territory and in the Cleveland district a plant has just been equipped with machinery sufficient for a considerable output. The pool's ability to maintain prices at their present altitude seems less assured than at any time in the association's history.

NINE iron plants at Youngstown paid out in wages in one year under the McKinley tariff, $3,770,000; in one year under the Wilson-Gorman act the wages paid by the same establishments amounted to but $1,550,000. In the difference of $2,220,000 a year, the iron workers of the Mahoning Valley have paid a dear price for the country's blind search for something that would be an improvement upon prosperity.

Prices of Iron and Steel in Nine Months of 1896.

Bulletin:—In the following table we give the average monthly prices of leading articles of iron and steel in the first nine months of 1896, per gross ton of 2,240 pounds, except for bar iron, and steel beams, which are quoted by the pound, and tin plates, which are quoted by the box of 108 lbs.

Months.	Old iron T rails, at Philadelphia.	No. 1 foundry pig iron, at Phila.	Gray forge pig iron, at Philadelphia.	Gray forge pig iron, Lake ore, at Pbg.	Bessemer pig iron, at Pittsburgh.	Steel rails, at mills, in Pennsylvania.	Steel billets, at mills, at Pittsburgh.	Best refined bar iron, from store, Phila.	Best refined bar iron, at Pittsburgh.	Steel beams, on dock, at New York.	Foreign coke tin-plates, per box, N.Y.	Domestic coke tin-plates, per box, N.Y.
Jan...	$14.25	$13.56	$ 11.55	$ 10.90	$ 11.81	$28	$16.60	1.45c	1.25c	1.57½	$3.85	$3.80
Feb...	14.75	13.50	11.50	11.00	12.95	28	17.69	1.40c	1.25c	1.50c	3.88	3.78
Mar..	15.00	13.45	11.30	10.92	12.25	28	17.19	1.35c	1.21c	1.55c	3.85	3.75
April	14.87	13.25	11.19	10.85	13.32	28	19.80	1.40c	1.20c	1.60c	3.80	3.70
May..	14.43	13.83	11.00	10.79	12.83	28	19.55	1.40c	1.20c	1.67½	3.72	3.55
June	14.00	13.75	11.00	10.62	12.47	28	19.42	1.40c	1.20c	1.70c	3.70	3.55
July..	14.00	12.75	10.90	10.37	12.12	28	19.50	1.40c	1.20c	1.70c	3.70	3.56
Aug..	14.00	12.75	10.75	9.63	10.91	28	19.2	1.40c	1.20c	1.70c	3.70	3.60
Sept..	13.50	12.50	10.75	9.50	11.31	28	19.41	1.40c	1.20c	1.70c	3.82	3.58

THE sixty-first meeting of the Foundrymen's Association was held at the Manufacturers' Club on Wednesday evening, Oct. 7. The programme for the meeting included the nomination of officers for the ensuing year, preparatory to the election at the annual meeting in November, and an address by Geo. C. Davis, chemist of Thos. Devlin & Co., Philadelphia, who it was announced would make a chemical analysis of foundry coke before the meeting and show the foundrymen how to make their own analyses, if required. Secretary Evans says that "the foundry trade has not been a very profitable one during the summer but there appears to be more confidence existing at this time and the impression seems to be that there will be a great improvement after the November election."

MILLER BROS., of Pittsburgh, will dispatch another force of workmen to Russia next Tuesday to construct the pipe works for which they have the contract, as mentioned last week.

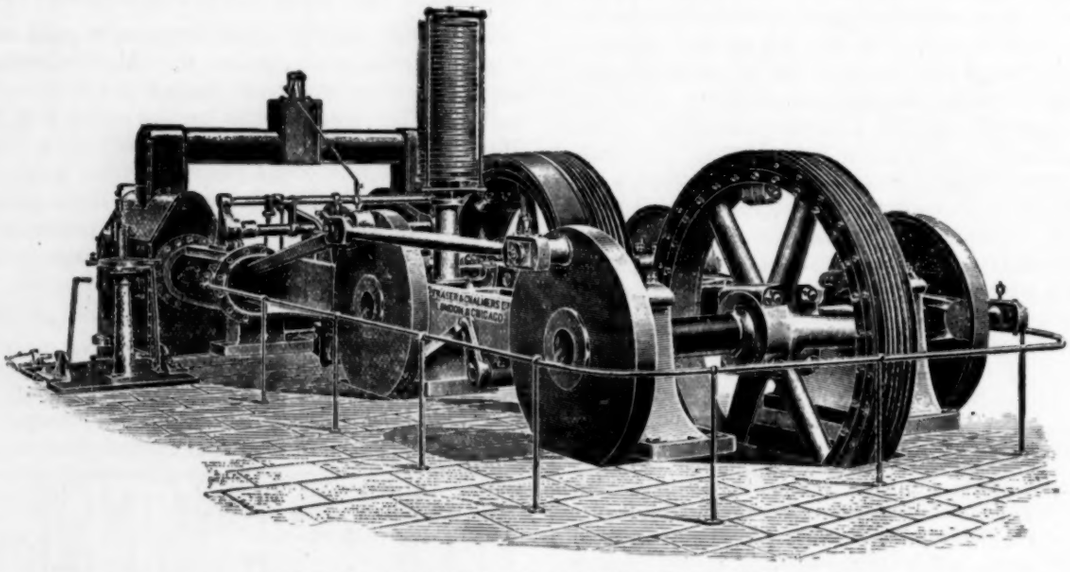
HOISTING FOR DEEP SHAFTS.

From a paper read by Mr. Walter McDermott before the Institution of Mining and Metallurgy (England), we take the following relative to hoisting plants of a type represented in some of the deep copper mines of the Lake Superior region:

"In hoisting from shafts over 2,000 feet in depth, the question of the best form of winding drum becomes important. It is not good practice to have round rope wind over itself, and the drum becomes of an unwieldly size when provision is made for winding in a single layer. Large diameters of drums have also a distinct disadvantage in starting the load, which disadvantage is met in part by using a taper drum. Flat ropes, winding on a single reel, as largely used in the United States, combine the advantages of a conical drum with a simpler form of construction; but round ropes are in more general favor among engineers. A third form of construction, which permits the use of small drums and round ropes, consists in passing the rope around one or two grooved drums and balancing the cages, so that the rope simply passes a few times round the drum and off again. A system of this description, as made by Messrs. Fraser & Chalmers, of Erith, Kent, and Chicago, is used in Germany, and of late it has been adopted on Lake Superior for the deep copper mines, where it is known as the Whiting hoist. The hoist consists of twin engines driving direct on a small grooved drum which is coupled by two connecting rods to a similar drum in front, like the two driving wheels of a locomotive. The front drum is set at a slight angle to the horizontal, so that the rope may lead straight to the proper groove of the other drum, and cause no chafing. The rope, after several turns over both drums, leads back behind the hoisting engine and around an anchorage grooved pulley fixed on a tension carriage which runs on a trail track, and is adjustable as to distance from hoist by a steam winch. This tension carriage controls, by its position, the depth from which hoisting is to take place from time to time. It is fitted with grips which clamp the carriage to the rails while hoisting is in progress, and which are released when a new adjustment of the depth of hoisting is necessary. The whole operation of changing the adjustment from one level of the mine to another occupies only a few minutes. This adjustability is very convenient for sinking work, as the skip may be run down to any point desired, while the upper one is just on the landing dogs. Any stretching of the rope can be immediately remedied by the tension carriage adjustment.

"The following particulars of the hoist at the Red Jacket shaft of the Calumet and Hecla copper mine on Lake Superior will show a simple arrangement for a very deep mine. The shaft is about 5,000 feet in depth at the present time, and cuts the lode at 3,200 feet. Size of shaft 13½ feet by 23 feet inside timbers. A twin compound condensing Corliss engine, 16 inches and 32 inches by 48-inch stroke, drives direct two grooved drums of 7 feet diameter with three grooves on each drum. Diameter of rope, 1¼ inches. The grooves of the drums are made of soft maple blocks. The run-way of the tension carriage is 650 feet long. Steam pressure, 120 pounds. The average speed of hoisting is about 1,200 feet per minute, but is run up as high as 1,900 feet. The weight of cage is 2,500 pounds, and of load, 3,000 pounds.

"This style of hoist has met with the approval of South African engineers, and one is now being erected by the Durban Roodeport Deep Level Mine, of the following details: the shaft will be about 1,000 feet vertical and 2,000 feet on the incline of reefs. The engine is a twin Corliss steam engine, cylinders being 20 inches by 48-inch stroke, arranged to be made compounded later by the addition of tandem cylinders. Drums, 8 feet diameter. Revolutions per minute, 75 giving a hoisting speed of 1,880 feet per minute. The cylinders are fitted with a Seymour equalized cut-off, giving a range from zero to 75 per cent of stroke. The illustration shown above is from a photograph of this hoist The weight of skip will be 3,300 pounds, and of load, 5,000 pounds."



HOISTING FROM DEEP MINES—VIEW OF WINDING ENGINE.

Strength of Welds.

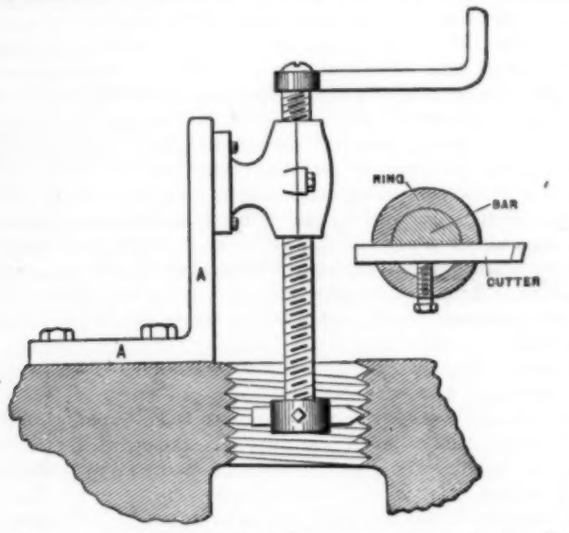
Some experiments have been made at the engineering laboratory of the University of Michigan to determine the strength of welded joints. Of a number of the specimens tested not one broke in the weld; as some of these were slightly larger at the weld, a new set of specimens was prepared and a cut taken from each in the lathe to reduce the piece to a uniform diameter throughout its length between the jaws of the testing machine. Common round iron was used. Three bars were taken at random, 1¼ inch, 1 inch and ¾ inch in diameter. From each bar four specimens were prepared, one solid, one lap-welded, one butt-welded and one split-welded. The results show that only two specimens, both lap-welded, broke at or near the weld; the fracture in one case was slightly crystalline and in the other fibrous. The strength in no case departed widely from the strength of the solid parts. It would seem from these tests that with skillfully made welds we may expect to get the full strength of the original bar.

It seems to be settled that there will be another chainless wheel put on the American market next year by a firm of high reputation. But it will be a special, not a regular wheel. The regular wheel of this concern will continue to have a chain. A bicycle expert points out that with a chainless wheel it is necessary to have an extraordinarily rigid frame so as to keep the cogs adjusted in their proper places and prevent them from binding or getting too loose to work as they should. This makes it needful to use a heavier frame than Americans are accustomed to and prefer. Chainless wheels have been comparatively successful abroad because people there do not object to bicycles weighing from 35 to 40 pounds —a weight that would be impossible here. In this expert's opinion the question to be settled is whether the adjustment of the cogs can be maintained with a bicycle of 23 or 24 pounds weight.

METHOD OF TAPPING VALVES.

W. J. Thompson, Toronto, Ont., writing to *Machinery*, describes the method pursued at the plant with which he is connected, in the tapping of a casting:

"We had some holes about 4½ inches in diameter to tap in a pump casting; we made taps, but it took so much power and they made such a poor job that we devised the following scheme: An angle plate, A, bolted to face of casting, with a spindle threaded (the same pitch as we wished in the hole), an old box babbitted for thread of spindle to travel in, and bolted to angle plate. The cutter, of ½-inch round self-hardening steel, was held in place by aid of set screw and collar and was loosened after each cut, so it did not become dull



backing out and was ready to be set out a little farther for the next cut."

CAR WHEEL FOUNDING.

Signs of Deterioration in the Product.

In speaking of the "ghost chill," one of the leading wheel manufacturers recently said: "There is nothing surprising about the ability to detect what is called a 'ghost chill;' in fact, nowadays I should think it would be a good deal more difficult to find one of the opposite kind, considering the work of a great many car wheel makers. The character of chill mentioned is produced by the use of manganese, which makes quite a coarse crystal in the chill surface of a peculiar shape so far as its angles are concerned. The fractured surface is brilliant and might be supposed to be extra hard on that account; but as a matter of fact the iron is in many cases possessed of less resisting power to wear than might be obtained from special manufactures of iron that were not chilled at all.

"The methods of some wheel makers are so crude, when considered by one famliar with the subject, as to make one wonder whether the actual knowledge of the material and quality of wheels is something so far beyond information that should be possessed by railway officials, who are generally posted on similar lines.

"The use of manganese in car wheel mixtures is perhaps responsible for more trouble experienced with wheels, of late years, than any other one thing, as with it wheel makers are able to use cheap non-chilling irons in scrap and to convey a quality of strength and appearance of chill that would seem to indicate a good wheel. Manganese is, however, an unreliable as well as an unsatisfactory constituent. The varying temperature of the furnace in which the mixtures are melted cause the manganese to take on different conditions in the metal when cast; its presence is excessive in some wheels and almost entirely lacking in others; and, generally speaking, the result is about the same as might be expected in the case of a man who being in poor health and condition, tried to keep up his strength by the use of artificial stimulants. The result at best can only be temporary, and the breakdown must come sooner or later. Of course, the wheel-makers have not been entirely responsible for many of the conditions of operations on electric railways, which would have caused more or less failures in any case; but to the extent that certain wheel makers have promoted unsatisfactory conditions by continually offering wheels a lower prices, they are responsible for the poor results that have done so much to injure the reputation of the chilled wheel."

Not a Fair Car-Wheel Test.

A correspondent of the *American Engineer*, referring to recent publications describing special tests made on cast iron wheels by casting a ring of molten iron around the rim of the wheels, says that he has made a great many experiments in this direction which are interesting in a sense, but they are entirely useless so far as showing any actual conditions which arise in service. "It would be as possible to prove that a gun was not of proper strength or construction by putting in a charge several times greater than ever would be used in actual service and exploding it. Car wheels are never instantly heated by brake service, but they become gradually, and often rapidly, hot from the friction of the brakes, and on long grades the heat becomes severe, but even then nothing to approximate the heat of a body of molten metal as is mentioned in your paper. As a matter of fact the conditions are almost exactly reversed from those of actual service, for in service the brake is applied cold and friction gradually heats the wheel, while in this 'test' a great extreme of heat in the shape of molten metal is applied instantly and allowed to gradually cool.

"The modern foundry makes car wheels to meet the requirements of the service to which they will be subjected, the same as bridge builders have their beams and trusses of the requisite strength, and electricians make their motors of the necessary power, etc. We might as well claim that by overloading and breaking an engine that all engines of that grade and strength are faulty and dangerous, as to assume that wheels subjected to a series of satisfactory tests approximating the actual requirements of service are not safe because one wheel cannot resist the strain of molten metal applied to its rim in a mass 4 inches deep and 1½ inches wide—an amount of heat and strain that would not be applied to the wheel in actual service were it to run a hundred years."

Money Possibilities of Coke By-Products.

Some idea of the saving possible in by-product recovery by coke manufacturers may be gathered from a statement made by Herr E. Hagenstock, of Dahlhausen, Germany, before a German technical association. He said that in the Rhenish-Westphalian district alone about 6,000,000 tons of coke are now produced and consumed, for which 8,000,000 tons of coking coal are required. If only one per cent of ammonia sulphate is recoverable on an average, a quantity of 80,000 tons of it can thus be recovered yearly. At the low price of 1m. per 2.2 pound of nitrogen, amounting, with a 20 per cent nitrogen content in the ammonia sulphate, to 200m. per ton of this salt, the country's wealth will be increased by 16,000,000m, or about $4,000,000. The *Iron and Coal Trades Review* asks: "What have the beehive coke manufacturers of England to say to this? Why do they still refuse to take up the by-product ovens? There must be good reasons for their refusing to embrace all this wealth, since coke manufacturers are not known to be less sordid than their neighbors." On the above basis, the saving possible to producers of Connellsville coke, in an average year, would be fully $5,000,000.

THE city of Cleveland has contracted with the Brightman Stoker Co., Cleveland, for four tubular boilers with mechanical stokers for the Division street pumping station. The Globe Iron Works Co. made a lower bid, but its smoke preventing apparatus has not been perfected.

THE Otis Steel Co., Cleveland, is making a large expenditure in improvements which will put it in shape to make a larger output and with the advantage of new economies. The plant is in operation this week, the policy being to run as orders accumulate to guarantee a week's activity.

THE Akron Iron & Steel Co., Akron, O., started up its puddling and finishing departments this week. During an eight weeks' shut-down repairs and improvements were made.

LAKE SUPERIOR IRON MINES.

At the Mansfield mine on the Menominee range, the new channel has been completed for the Michigamme River, which broke into the mine in 1892 and destroyed the workings, with loss of life. The water was turned into the new course last week, and the old river bed, below the dam that was built, drained rapidly. In the old bed ore has been found six inches below the silt and it is believed it will prove to be a vein. The ore of the Mansfield, so far as it had been worked before the flooding four years ago was a desirable Bessemer. If the discovery recently made turns out to be what is now hoped, the deposit will be worked at first as an open-cut proposition.

The Oliver Mining Co. has taken out 800,000 tons this season and it is expected that shovel work will cease this week. Two shovels and 125 men have been getting out about 5,000 tons a day.

Two shafts are down, one 60 and the other 90 feet, at the property of the Arcturus Mining Co., in town 55-24, the extreme western development on the Mesabi. A drill has gone through 145 feet of ore to the bottom of the deposit, proving to be all Bessemer.

The Franklin mine resumed shipments last week at the rate of 1,000 tons a day.

The Metropolitan Land & Iron Co. now has 150 men at work, 55 having been put on at the Pabst and 35 at the East Norrie, in addition to those formerly at work.

About 90 men are employed at the Genoa mine of the Minnesota Iron Co. The property has been improved the past season and is in position to make a good output in 1897.

Work at Section 10 mine west of the Iron Belt has been discontinued. Upwards of 10,000 tons of the ore has been shipped to Lake Erie docks.

The Tilden mine now has less than 50 men on its pay rolls, though in a good season 700 to 800 men would be employed.

The Lake Superior & Ishpeming Railroad will extend its line through Ishpeming the coming winter, building to the Lake Superior and Salisbury mines.

The Cincinnati mine on the Mesabi has been reopened with 200 men, an additional sale of 15,000 tons of ore having been made.

Edison's Ore Concentrating Project.

A paper by S. B. Patterson, superintendant of the Andover Iron Co., of Phillipsburg, N. J., contributed to the 1895 Report of the Bureau of Statistics of Labor and Industries of New Jersey, has the following concerning Edison's iron ore concentrating operations:

"There are only two concentrating plants now running in the State. One is a small plant at Port Oram, run by the New Jersey Iron Mining Co. on the small amount of lead ore obtained while mining their rich (old Irondale) ore, and on some lean ores mined in that neighborhood by them especially for concentration. I understand that recently they have purchased a lot of Beach Glen ore, (one mile from Hibernia), which is a lean ore that has been laying there a great many years, being too poor for shipment. The other active operation is conducted by the electrician Edison, the corporation (of which he is probably the chief stockholder) being called the Pennsylvania and New Jersey Concentrating Works. This operation is undoubtedly the most extensive experimental research on record. It can hardly be called a business operation, there having been spent, as I am informed, and fully believe, $1,500,000 in the course of five or six years, and with almost no results. It is hardly necessary to say that the name Edison carries conviction to the public mind that success can not be gainsaid, but I think that among practical ore men, who have seen the operations and the material worked upon, and who can gauge such matters by cold facts and figures, a large proportion consider success on present lines highly improbable. A very great difficulty which presents itself is that the cost of crushing this very lean material (about 18 per cent iron) is such as to seem to preclude the possibility of success. To secure a nearly complete separation of the ore from the gangue, very fine pulverization is necessary, and with a hard rock this can only be accomplished at a very great cost. The expense of quarrying a ton of the raw material must be added to the cost of pulverization, and this sum must be multiplied many times, and to this product must be added the cost of concentration to get the final cost of the concentrated ore. I am well satisfied that at no time has been less than the cost of a ton of pig iron at the corresponding period.

"The character of the concentrated product is another difficulty that has not been overcome. Its extreme fineness either causes a heavy loss of material in handling and transporting, or, if this loss is to be prevented, a heavy expense is incurred in preventing it. Then, too, the use of this ore in a blast furnace in this finely divided state, unless in very small amounts, is impracticable if not hazardous."

Personal.

J. H. Cremer, the well-known Cleveland chemist, will start this week on a trip to Europe. Until March 1 his address will be care of Hotel de Flanders, Antwerp, Belgium.

George Warrington, the well-known engineer, formerly connected with the Vulcan Iron Works, of Chicago, has accepted the position of general manager of the National Boiler Works, Chicago.

F. H. J. Porter, general Western sales agent of the Bethlehem Iron Co., read a paper on "Steel Forgings" before the Western Society of Engineers at their regular monthly meeting, Wednesday evening, Oct 7, in the auditorium of Armour Institute, Chicago. The paper was illustrated by lantern slides descriptive of modern methods of making miscellaneous forgings, armor plate, guns, etc., and explained the merits of fluid compressed steel and of hollow forged shafts and similar forgings.

James Wood, proprietor of the Duquesne Tin Plate Works, Pittsburgh, died very suddenly last week.

John F. Armstrong, a well-known Lake Superior mining engineer, has resigned the superintendency of the Sellers mine at Hibbing, Minn., and will go farther West to engage in mining.

Andrew Carnegie is expected to arrive at New York Oct. 9 on the *St. Louis*.

Oliver Williams, Republican nominee for Congress in the 9th Pennsylvania district, comprising Berks and Lehigh counties, was for 25 years identified with the Catasauqua Mfg. Co., a leading iron manufacturing company of the Lehigh Valley. He became its manager in 1867 and later was president, holding that position up to 1892. He is still largely interested in this as well as other manufacturing enterprises Mr. Williams for a number of years was president of the Eastern Bar Iron Association. He has frequently appeared before Congressional committees on tariff and other industrial questions. He was born in Wales in 1831 and learned the molder's trade at Allentown, Pa.

THE production of iron ore in Ohio in 1895, as reported by the recently published abstract of the report of the Chief Inspector of Mines, R. M. Haseltine, was 93,051 tons. The abstract says that this was "a loss of 2,263 tons as compared with 1894, then the lowest in the history of the department." Referring, however, to the report for 1894, we find the production in that year is put at 58,043; so that if the 1895 figures are correct, there was a marked increase in that year. In answer to an inquiry on the subject, Inspector Haseltine says that there was an increase in the production for 1895 of 35,008, over that of 1894 and that he is at a loss to explain the error. The statistics of Mr. John Birkinbine, collected for the "Mineral Resources" volume of the United States Geological Survey, make the production for 1895, 44,834 tons and for 1894 58,493 tons, showing a considerable decrease last year. Iron mining in Ohio is now confined to Jackson, Lawrence and Scioto counties—the Hanging Rock district.

THE Excelsior furnace at Ishpeming, Mich., which has been making a good record for output in the past year closed down this week, having a considerable stock of iron on hand. M. A. Hanna & Co., Cleveland, are now selling agents for this iron in lower lake territory and tributary districts.

THE Cambria Iron Co., Johnstown, Pa., closed down in all its finishing departments on Oct. 7. The plant will resume as soon as sufficient orders accumulate.

THE Republic Iron Works, Pittsburgh, started up 26 furnaces on Monday.

GRAY IRON WORK AND MALLEABLE.

Some Difficulties Encountered in the Latter.

The operation of light work foundries is by no means the smooth sailing imagined by those who consider that machinery foundries have a monopoly of emergencies and set-backs. And as between gray iron and malleable work there is a vastly greater diversity of conditions and of practice than is taken account of, from the standpoint of heavy-working founders. A contributor to the *Iron Molders' Journal* considers some of the difficulties encountered by those who have occasion to go from any branch of gray iron into general jobbing, on white or malleable iron, with some suggestions as to the best methods of disposing them. The chief difficulties, he points out, are: 1, Difficulty in running ; 2, obtaining a good skin or face; 3, keeping the casting clean; 4, prevention of shrinkage in untoward places; 5, prevention of cracking. The writer then comments:

"In regard to the first, it will require but little experience to prove the necessity of paying careful attention to the gating of even fairly heavy work, and of pouring it with iron of much greater heat than would be the case in gray iron.

"In reference to the second, there is much more need to use facing on even small castings, than would be the case in gray iron; for in the first place the iron burns into the sand far worse, and again, where there is any thickness of casting, there is great difficulty in preventing honeycombing. This latter is often said to be caused by wet sand or hard ramming; this is, however, a decided mistake, as it is in reality caused by high iron (particularly so is this the case when the mixture is burnt), and is most probably because of the excessive generation of both nitrogen and hydrogen. Being dependant upon the condition of the iron, so far as the molder is concerned, it is to some degree unavoidable; in ordinary work, however, the difficulty is generally overcome by using sea coal facing of sufficient quality and strength (the carbon apparently influencing it), with the addition of plumbago (by brush or bag), or a little heavy facing. In any work of considerable surface and metal, facing sand alone seems ineffective; often the honeycomb will take the form of little blow holes below the skin or face, and not discovered until the piece is planed. The only course then for a molder to adopt, is to cut some two or more heavy 'risers' or 'feeders,' and flow the iron through and through. If this course proves inadequate, he may very fairly blame the iron for the failure. In any case, the face of a piece to be planed, if possible, should be molded (or poured if not molded) face down.

"In the third difficulty enumerated, viz: to keep the casting clean, it must be borne in mind that this is a much harder task in malleable iron than in gray iron, for the most obvious reason, to wit—the difference in the mixture. The best principle to work upon in this respect is to gate very light, with the sprue or gate pin as far removed from the gate as may be convenient, to pour fairly hot, and to keep the sprue full from the very start. In many classes of work it is necessary to add risers,' but for nearly all small, general work, the light gate will prove adequate.

"In reference to the fourth, the prevention of shrinkage, it is almost unnecessary to point out that there is far more trouble in general with white iron in this praticular than with gray iron, for although gray iron with over two and a half per cent silicon will shrink a great deal, whether poured hot, medium or cold, yet so soft a mixture is seldom used in jobbing work. White irons, on the contrary, suitable for annealing purposes, are necessarily high in both silicon and carbon, and are therefore liable to considerable shrinkage. Thus it is that the gating of a piece of work is an important feature in this branch. The ordinary half-round gate of stove plate, etc., will not do here, nor will it do to gate just wherever the notion strikes one; the gates should be far removed from any section or joint in the least liable to shrink, then, after being cut with an ordinary gate-cutter, they should be squared and slicked flat, to secure a square, even gate for three-quarters of an inch back from the casting, otherwise there is liable to be a shrinkage under each gate. If possible, gate at the end or where the least strain will have to be borne by the casting, as even without an apparent shrinkage, there always seems a weakness at the gate. All uneven places, especially balls, hubs, (uncored), any square joints or sharp flanges are very liable to shrink. Square corners or flat places, easy to chill, are usually so served by ordinary, common or special shaped chills. This is a simple method, but not always the best, for if the piece be heavy, the chill may be burnt or melted; at any rate often in chilling it renders the piece of uneven degree, and thus to a more or less extent affects the perfect annealing. Again, chilling often only chills a piece upon the surface, a shrinkage being found upon breaking up the casting. Feeding the casting by means of large 'risers,' used as 'feeders,' however, will often be found the best remedy, that is, if cut heavy enough and with sufficient 'feeder' gate, for by such means (in contradistinction to the chilling method) the doubtful parts are fed, until they set and can shrink no more. This is especially the case where the iron is flowed through and through; the general principle to be borne in mind is, that any spot liable to shrink, must either cool first or be kept hot till the last, viz: by chilling in the former, or by feeding in the latter. Never set nails in to prevent shrinkage where strength is required, in fact nowhere except where appearance only is the object sought; for, although it may 'hold up' a ball in the cope nicely, yet if the casting be broken, an ugly shrinkage will be found.

"The fifth difficulty, cracking, though by no means confined to malleable iron is more troublesome here. One general principle to observe in this case is, if the casting be light, to pour it early in the heat, while the iron is low; this, however, can not be done with heavier work, which will require higher iron to anneal properly. Sometimes the gates are heavy enough to crack very light castings; this, however, can generally be judged beforehand, and then the work should be 'sprued' hot. Where this is not the case and the difficulty results from the uneven character of the casting, it often suffices to leave it in the sand until thoroughly cold. At times it is necessary to chill square joints where the iron would otherwise draw, till it makes a very dirty looking break (through being hot when breaking). Again, in the case of fairly heavy work, when every other method fails, it is necessary to take the casting out hot and put it into the furnace after the iron is run out, thus allowing it to cool off with the furnace; this seldom fails, but of course is applicable only after the last heat."

Iron for Malleable Castings.

Special iron has to be selected for castings that have to undergo conversion into "malleable cast iron." It must be very hard, and Lorne and Cumberland brands [in England] are largely used, with some white or mottled hematite. Gray iron is quite unsuitable. The castings should show a fine brilliant white crystalline structure when broken, and so hard that they can not be cut or filed. They have to submit to annealing for several days before they can be operated upon. Small castings are packed in cast iron boxes in the annealing furnace, and completely surrounded with iron ore or metallic oxides. Red hematite ore is mostly preferred. The ore can be used several times, but requires to have the addition of a little fresh unburnt ore every annealing. Small articles should be kept in the annealing oven at a uniform red heat in the iron boxes for six or seven days, but thick castings may require three or four weeks' annealing. Extra care is required in the molding of articles for malleable cast iron. The molds must be very clean, for any dirt or slag shows conspicuouly when the castings have come through the annealing oven. Malleable cast iron is undoubtedly of great value in such articles as wheels and pinions. Steel is, however, now superseding the use of malleable cast iron to a great extent, for it is little, if any, dearer. Sharp internal angles of all kinds in the patterns for steel or malleable castings should be avoided.—[Engineer.

The *Railway Age* gives a list of the railway employes in the United States showing the reductions in the bad times. In 1892, there were 821,415 employes; in 1893, 873,602, and in 1895, 785,034. It is probable that enforced retrenchments have reduced the number of employes from 1895. If honest money prevails next month, thousands of idle men will be added to the army of railway employes. The railway vote is probably in excess of 800,000, all employes including idle men, etc., bringing the total to about 1,000,000.

IRON ORE PRODUCTION IN 1895.

The report of John Birkinbine, of Philadelphia, to the United States Geological Survey, for the 1895 volume of the Mineral Resources, covers the production of iron ores in this country in 1895. The statistics for the Lake Superior mines have been given heretofore in these columns, and the discussion in the report, on the relative cost of mining on the various ranges and of getting ores to market, was anticipated in a paper prepared for *The Iron Trade Review* of Jan. 2 of this year. From advance sheets of the report we make some extracts below that will prove of interest. The report will be accompanied by five maps—a general map of the Lake Superior region, and maps of the Marquette, Menominee, Gogebic and Minnesota districts respectively. Mr. Birkinbine's statistics of the Lake Superior district give the production in 1895—the amount of ore actually taken from the ground. This total was 10,328,248 tons. The shipments, as shown in *The Iron Trade Review* tables, were 10,429,037. We quote from the report:

It would be difficult to determine closely the amount of iron ore mined which was within the Bessemer limits prescribed by the steel manufacturers, for this limit has been narrowed to meet the conditions of trade. While metal which does not exceed one part of phosphorus in 1,000 of iron by weight is by common consent within the Bessemer limit, late specifications for steel rails do not accept 0.1 phosphorus, but demand 0.085 phosphorus, and as a rule the adaptability of an ore is influenced by the phosphorus in the fuel and flux employed, as well as by the composition of other ores available at a given blast furnace.

The combination of mine operators lately formed to regulate the production of Bessemer ores includes some which produce ore exceeding 1 part of phosphorus to 1,000 of iron, although the basis of sales is upon ore carrying 62 per cent of iron and 0.045 per cent of phosphorus, and advance prices are allowed only on such ores as give a smaller proportion than 1 of phosphorus to 1,300 of iron. However, in determining the relative values of ores produced by mines represented in this combination, all the various elements entering into the composition of the ore are considered.

The following table shows the quantities of iron ore returned as being produced in the various States for the past six years, and also the totals for the entire country and the amounts of foreign iron ores imported:

PRODUCTION OF IRON ORE, BY STATES, FROM 1890 TO 1895.

State.	1890.	1891.	1892.	1893.	1894.	1895.
	Long tons	*Long tons*	*Long tons*	*Long tons*	*Long tons*	*Long tons*
Michigan	7,141,656	6,127,001	7,543,544	4668,324	4,419,074	5,812,444
Alabama	1,897,815	1 986,830	2,312,071	1,742 410	1,493,086	2,199,390
Pennsylvania	1,361,622	1,272,92[illegible]	1,084 047	697,985	532,087	900,340
New York	1,253,393	1,017,216	891,c99	534,122	242.759	307,256
Wisconsin	948,965	589,481	790,179	439,429	347.501	649,351
Minnesota	891,910	945 105	1,255 465	1,499 927	2,968,463	3,866,453
Virginia	543,583	658 916	741 027	*a* 616,965	*a* 600,562	712,241
New Jersey	495 868	525,612	465,455	359,150	277,483	282,433
Tennessee	465,695	543,923	406,578	372 996	292,831	319,796
Georgia	244,088	350,755	185,054	*b* 186,015	*b* 174,694	*b* 272,014
Missouri	18[illegible],690	106,949	118,494	7[illegible],863	81,926	12,512
Ohio	169,088	104.487	95,768	68 141	58,493	44,834
Colorado	114,275	110,942	141,769	171,670	250,199	240,937
Mon., Ore., New Mex. and Utah	81,632	*d* 93 730	44,875	*d* 38,716	*h* 44,438	*i* 47,026
Kentucky	77,685	65,089	50,523	36,714	42,548	42,093
Maryland	35,657	37,379	40,171	13,830	7,915	981
Massachusetts	32,934	47,502	44,941	40,752	30,259	39,142
Connecticut	26,058	30 923	31,324			
West Virginia	25,116	6,200	6,000	(*f*)	(*f*)	.....
North Carolina	22,873	19,210	25,379	(*g*)	(*g*)	(*g*)
Texas	22,000	51,000	22,903	25,620	15,361	8,371
Maine	2,500	.....	.....	.....	.....	.....
Total	16,036,043	14,591,178	16,296,666	11,587,629	11,897,679	15,957,614
For'gn ore imp	1,246,830	912,864	806,585	526,951	167,307	524,153

a Including West Virginia, *b* Including North Carolina. *d* Including Idaho. *f* See Virginia. *g* See Georgia. *h* Omitting Oregon and including Nevada. *i* Omitting Oregon and including Nevada, Wyoming and Idaho.

Referring to the relative positions of the Lake Superior ranges as to quality of ore produced, the report says:

The Vermilion and Gogebic ranges produce ores mainly of Bessemer grade—the former generally hard and quite high in iron, the latter, as a rule, soft and somewhat lower in iron; the condition of some of the prominent mines indicating that the latter range has produced its maximum, and will be comparatively a less important factor than in the past.

The Marquette and Mesabi ranges have closely approximated each other in supplying 40 per cent of Bessemer and 60 per cent of non-Bessemer ores, although the latter may in the future outrank the former in the proportion of Bessemer ores.

The Menominee range produces mainly non-Bessemer ores, which are carried by railroad an average of 50 miles before obtaining water shipment, and has its outlet on Lake Michigan, avoiding delays due to canal passage, with shorter vessel carriage and at present deeper draft for much of its output. It is also closer than any other range to blast furnaces in Illinois and Wisconsin which can receive the ore by all-rail routes, and the season when ice obstructs navigation is shorter than on Lake Superior.

While most of the ores found in the Menominee range are non-Bessemer, it is an important source of supply for steel works, for one of its large mines produces liberally ore very low in phosphorus, and the ore obtained from its largest producer, while outside of the Bessemer limit as to phosphorus, is largely used in Bessemer mixtures.

The advantage of this shorter vessel haul is also shared by a considerable portion of the ores from the Marquette district, and some from the Gogebic range have reached water transportation on Lake Michigan by a railroad haul of 150 miles. But with the completion of the two large locks at Sault Ste. Marie and the deepening of channels connecting Lakes Erie, Huron, and Superior, the encouragement to send ores from the Marquette range via Lake Michigan will be less pronounced, except for such as are supplied to furnaces on or adjacent to that lake.

Cleaning and Sharpening of Files.

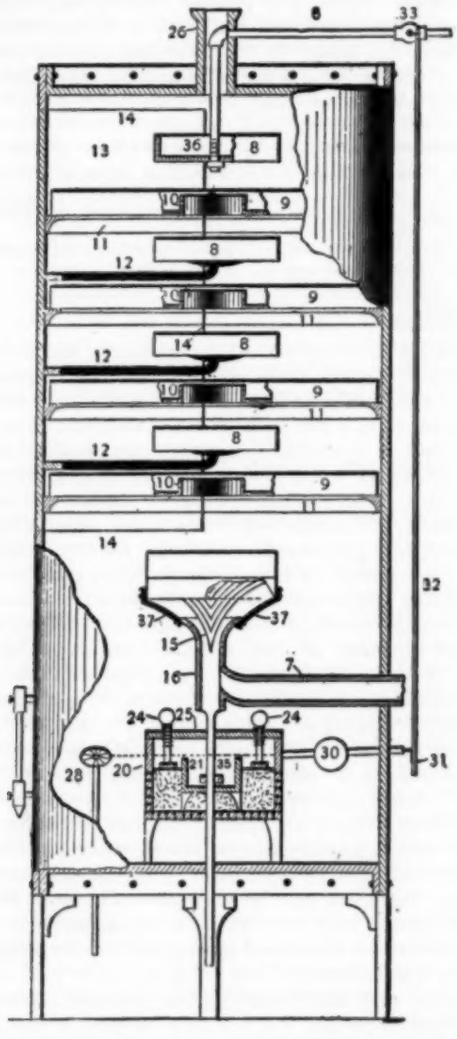
Files and rasps used for working tin and lead can be cleaned and sharpened in the following manner: Dip the file for a few seconds into concentrated nitric acid until reddish brown vapors commence to ascend lively, then rinse in water, rub with a sharp brush and inbed the file in sawdust or coal dust or dry it quickly for immediate use. A file clogged up by iron filings should be dipped into a watery solution of copper vitriol, by which the filings are dissolved and copper precipitated in the form of a slimy sediment, while the body of the file is attacked but little. Afterwards rinse the file in water, brush off, dip into nitric acid and conclude treatment as above. Files dulled by zinc filings are given a bath in diluted sulphuric acid, otherwise they are subjected to the same treatment. Clean all files used for working copper by means of nitric acid, but repeat the process several times, because the first time much copper is precipitated that adheres tenaciously to the body of the file. Files used for working wood are first put into hot concentrated sulphuric acid, rinsed, brushed, then dipped into lye of potash, rinsed and brushed again and finally dried. Drying can be accomplished best and quickest by pouring alcohol over the file and burning it off.

THE Cincinnati *Commercial Tribune* has interviewed business men there about their trade in 1896 and the chances for the near future. Daniel B. Meacham, of Rogers, Brown & Co., says that the consumption of iron is undeniably light, but that Southern furnaces, in view of recent sales to investors, are refusing to sell for the first half of 1897 except at an advance of more than 50 cents a ton over the prices of the summer. He anticipates a slow and steady revival until November, and then, after a crushing defeat for free silver, a more rapid expansion. Chas. F. Thompson, of the Lane & Bodley Co., says that the business of his company in the first eight months this year was 17 per cent better than for the same period in 1895. The outlook for iron working machinery shops is hopeful on account of the employed condition of European shops, many foreign buyers not being willing to wait on the delayed deliveries of their home works. The dormant season being at hand many undertakings in the United States will not be pressed this season in any event. He expects a quiet winter, with a slowly increasing volume of business and no marked gain in prices. Robert Laidlaw, of the Laidlaw-Dunn-Gordon Co., manufacturers of pumps, says that prices of machinery were never lower than at present, but that very few among those who have money to invest care to take advantage of the very low prices, letters coming almost daily from customers who decide to "wait until after election." He believes that with a sound money victory confidence will be restored, bonds will sell readily and money will again go into circulation, causing a revival of business.

CALKINS' EXHAUST STEAM HEATER.

The illustration shows a feed water heater designed by James S. Calkins, of Hastings, Mich., which has several features of interest. The feed water is admitted through the pipe 6, and the exhaust steam through 7. Pans are arranged one over the other, a small one alternating with a large one. The large one has an opening at 10 beneath the small pans. The large pans rest on ledges 11. The upper small pan is fastened to the lower end of the water pipe, while the rest are supported by arms 12, attached to the door 13, shown by line 14. When the door is opened the small pans swing out with it. Below the large bottom pan is a pendant serrated cone 15, with its small end pointing down into the mouth of an oil pipe 16.

This cone has V form serrations; with the small end of the V downward. The top of the cone flanges over, so that all oil which might work up would be stopped by it, and run down to the pipe 16. Below this oil-catching device is a filter 20, in which is a water box 21. The filter is filled with some



suitable material, and the sides and bottom closures are perforated to let the water through the filtering material. The inner walls of the filter are a little lower than the water line.

The filtering material each side of the water-box is held down by bars, held adjustable to place by pressure-screws 24, passed through screw-threaded holes in the cover of the water-box and filter. The cover, 25, is very important as it keeps clean all the filtered water which passes into the water-box.

A let-off and skimmer, placed at the surface of the water, is provided with a pipe to carry off the water when the tank would otherwise get too full. The water should rise just high enough to run over into the water-box. The skimmer, 28, is like a flattened funnel lying on its side on the water, so that any scum which might be on the surface of the water will run into it.

At 30 is a float having rods attached at each side near one end, these rods have bearings in the side wall of the filter at one end and at the other end in the wall of the tank. This rod has a crank 31, at the outer end with which is connected a connecting rod, 32, the upper end of the rod connecting the crank with a valve, 33, in the water pipe 6. By this means when the water gets high enough in the tank the valve will close in the pipe 6, and open if the water gets too low, and thus regulate the supply of water. The water is drawn from the water-box by a pipe, the end of the pipe being provided with a screen, 35, in the water-box, in the usual way.

In the operation, the water which comes into the upper small pan 8, through the holes at 36 in the pipe 6, overflows the pan and the water drips down over the side into the first large pan, 9. When this large pan is full enough to run over the flange of the hole 10, it drips down into the next small pan 8, and so on, until it reaches the bottom of the tank. The steam from the exhaust, entering the pipe 7, passes up against the broad bottom surface of the large pan and up through the central hole 10, against the bottom surface of the small pan and around it and on up, condensing and heating the pans and the water which it comes into contact with, and goes on up out of the pipe 36, at the upper end of the tank, if it does not all become condensed before that. The exhaust steam first comes in contact with the serrated surface of the cone, depositing the oil therein on its surface, as stated. This cone is held up to place by a series of separated arms, 37, attached to it and to the upper end of the pipe 16.

The October *Lippincott's* has among other stories, sketches and descriptions: "Bullwinkle, the History of a Poor Student;" "England's Indian Army," describing particularly the native troops; "Russian Boys and Girls at School," by Isabel F. Hapgood; "The Last Resort in Art"—copying in the Galleries of Europe, by Ellen Olney Kirk; "The Need of Local Patriotism," by Prof. Wm. C. Lawton. The complete novel is "The Crown Prince of Rexania," by Edward S. Van Zile. *Century* has in its "Topics of the Times" timely editorials on "Government by Hysteria," "The Workingman's Interest in the Gold Standard," and "Silver's Worst Victims." The sound money campaign of this magazine began long before the question became the chief national issue, and its contributions to the discussion have been particularly able. "About French Children," "Glave in the Heart of Africa," "A Study of Mental Epdemics," and "A Presidential Candidate of 1852," are among noteworthy contributions to this number. The October *Outing* is a readable number and has many good illustrations. Sara Beaumont Kennedy has a strong story of the Old South; Walter Camp writes on "Football;" E. B. Abercrombie tells of "Trotting Road Teams and Their Drivers," and there are two interesting articles on American and English river craft. In the October *Forum* are four strong articles on "What Free Coinage Means," by ex-President Harrison; President McCall, of the New York Life Insurance Company; President King, of the Union Trust Co., and John M. Stahl, secretary of the Farmers' National Congress.

THE *Boiler Maker* says of the outlook in that trade: "The chief feature of the business situation at the present time is the disposition of large buyers to enter the market and make their purchases for deliveries extending over a period of three to six months. As a consequence a much better inquiry was developed during the latter part of September, and good judges of the situation seem to feel assured that at least a moderate revival in trade is close at hand. It is too early to form a very definite opinion as to the future, but all signs, such as the influx of gold into the country, the better feeling in financial circles, etc., would indicate that our hopes are well founded. Business from store has shown quite a perceptible improvement during the past month."

THE secretary, A. Sorge, Jr., sends the following notice: "The next regular meeting of the Western Foundrymen's Association will take place at the Great Northern Hotel, Chicago, at 7.30 p.m., Wednesday, Oct. 21. The report of the Committee on Apprenticeship, which was not taken up at the last meeting, will be presented for discussion. As the discussion of the papers read at the last meeting was somewhat desultory and incomplete, it is desirable that it be continued and that members come prepared. Non-members are cordially invited to be present and join in the discussion."

VARYING COSTS OF OPEN-HEARTH STEEL.

The relative costs of stock for steel-making, by the various processes, and the comparative cost of basic steel in the Pittsburgh district and the Birmingham district are discussed by Mr. H. H. Campbell in the open-hearth chapters of his new work, "Manufacture and Properties of Structural Steel." By permission of the Scientific Publishing Co., by whom the work is copyrighted, we are enabled to present the following extracts from the sections of the work devoted to open-hearth costs:

Popular errors regarding the basic open hearth process.—There is one general misunderstanding in the engineering profession concerning the basic process which needs to be corrected. It is currently believed that the basic open-hearth is a kind of magic retort into which almost anything in the shape of iron can be treated at a minimum cost and converted into a metal just good enough to deceive the engineer; and it is also a prevailing opinion that the manufacturer would always like to have the privilege of making steel in such a furnace on account of the cheapness of the raw material. It may not be amiss, therefore, to say that in the Norther and Eastern States the cost of making ordinary structural steel is greater on the basic than on the acid hearth. This arises from the fact that mill iron costs very nearly as much as Bessemer iron, and that pig iron usually constitutes only one-third or one-half the charge. The rest is scrap, and there is no cheap phosphoritic low carbon material in the market, for wrought iron is worth more to rework than to melt and sells at a higher price than steel scrap. If the charge is one-third pig iron and two-thirds scrap, the advantage in stock will be only one-third of the difference in price between good and bad iron, and this difference is very seldom as much as two dollars per ton, so that the gain may easily be covered by the basic additions and the additional labor and repairs. If a greater proportion of pig be used, the waste, the extra time necessary, the increased fuel, and the lessened output will generally counterbalance the gain.

Relative cost of stock in the Pittsburgh district for making steel by different processes.—Leaving out of consideration the incidental running expenses, it may be well to consider one or two extreme instances to see what bearing the nature of the raw material has upon the cost of the product. The impossibility of giving a general value to pig iron and scrap is recognized, but if the open-hearth and the Bessemer are charged the same price for the same stock, and if it is assumed that scrap is worth one dollar more than pig iron, the error will not be great in the comparison. It is true that Bessemer pig iron has been made for less than $11 per ton in Pittsburgh, but this was only rendered possible by a complete disregard of those royalties and profits on the ore, the coke, the transportation, and the manufacture, which rightfully belong to the capital invested and which must assuredly be paid in the long run to insure the continuance of industrial life.

The waste is assumed to be the same as in acid practice, for although there is twice as great a volume of slag, it contains only half as great a percentage of iron, but the slight gain in cost of stock is fully overcome by the extra cost of hearth material.

The substitution of any other values in the calculation is a matter of simple arithmetic, but it will be evident that no radical change can be made in the comparison of acid and basic practice when using similar mixtures. The field for the basic hearth in the north is in making the finer qualities of steel with a low content of phosphorus. It is difficult to give the cost of low phosphorus acid steel owing to the wide variations in the cost of pure stock, but it may be roughly stated that pig iron and scrap containing less than .04 per cent of phosphorus are worth $4 per ton more than common metal averaging about .10 per cent.

PITTSBURG DISTRICT.

ACID BESSEMER.

Ten tons pig-iron @ $11.00	$110.00
Product, 9 tons steel.	
Cost of stock $12.22 for each ton of finished product.	

ACID OPEN-HEARTH.

Six tons pig-iron @ $11.00	$ 66.00
Eighteen tons scrap @ $12.00	216.00
One-third ton best ore @ $3.75	1.25
Total	$283.25
Product, 23 tons steel.	
Cost of stock, $12.32 for each ton of finished product.	

BASIC OPEN-HEARTH.

Six tons pig-iron @ $10.00	$ 60.00
Eighteen tons scrap @ $12.00	216.00
One-third ton best ore @ $3.75	1.25
Three thousand pounds pure burned lime	6.00
Total	$283.25
Product, 23 tons steel.	
Cost of stock, $12.32 for each ton of finished product.	

Economic conditions in the South.—The conditions in Alabama and Tennessee are widely different from those which have just been discussed. Considering first the case of a works which purchases no outside low carbon material, it will be evident that the amount of scrap available will be the amount which is produced at the works, and this will be about 30 per cent of the ingot weight, or about 25 per cent of the charge. The proportion of pig iron will accordingly be about 75 per cent.

The high sulphur and poor quality of Southern fuel, and the high silica in the coke and ore, will render very difficult, if not impracticable, the economical manufacture of pig iron which shall be low in both silicon and sulphur. It will be much safer to make regularly a product slightly high in silicon, which is only objectionable, rather than to often make high sulphur, which is fatal. In the following assumed composition the sulphur is put at a workable amount, while the silicon is placed at what seems a fair percentage.

ALABAMA IRON.

Eighteen tons pig-iron: Si, 1.50 per cent.; P, 0.75; S, 0.10; Mn, 0.25; C, 3.50.
Six tons scrap: C, 0.10; Mn, 0.50; P, .05; S, .05.

Average charge, 53,760 pounds.

Si,	1.12 per cent.	602 pounds producing 1290 pounds SiO_2.
Mn,	0.30 per cent.	
P,	0.58 per cent.	312 pounds producing 715 pounds P_2O_5.
S,	0.09 per cent.	
C,	2.65 per cent.	

Total Oxidizable metalloids, 4.74

About 8,000 pounds of ore will be necessary, and if this carries 3 per cent of silica, there will be an additional 240 pounds, making 1,530 pounds of silica. If the final slag contains 19 per cent of SiO_2, 9 per cent of P_2O_5, and from 45 to 50 per cent of CaO, it is evident that there must be added two and one-half times as much CaO as there is SiO_2, or about 3,825 pounds CaO, which is equal to 4,780 pounds of ordinary burned lime. This lime will run about 4 per cent in silica, thus furnishing 191 pounds. Allowing for this, there is a total of 1,721 pounds of silica requiring 4,300 pounds of lime. The final slag will weigh 8,000 pounds and will contain about 15 per cent of combined iron and 5 per cent of shot, making about 1,600 pounds of iron which will be carried away, or about 3 per cent of the charge. Together with the 4.74 per cent of oxidizable metalloids there will be theoretically a loss of nearly 8 per cent., or 4,300 pounds. The ore will supply more than this amount of metallic iron and hence, by calculation, the weight of metal tapped should equal the weight charged. Experience proves that this is not quite true, for there is always a certain quantity of dirt entering with the stock, as well as a scorification of hearth, walls, and roof, and since all such foreign material increases the volume of slag, and since there will also be a certain loss of metal down the ports, it follows that there will be a deficit, which in the following calculation is assumed to be about two per cent. The summary is as follows:

It may be said that some iron has been made in Alabama for less than $7 per ton, but it is very doubtful if the average cost for any furnace, for a period of five years, would be any lower if bad iron were marked off at its real value, and if all the general and operating expenses, together with the depreciation and interest charges, were properly distributed. It is more probable that a higher figure would more fairly represent a healthy industrial and financial situation.

BIRMINGHAM DISTRICT.

Eighteen tons pig iron @ $7.00	$126.00
Six tons scrap @ $7 00	42.00
Three and one-half tons pure ore @ $4 50	15.75
Four thousand three hundred pounds pure burned lime @ 16 cents per bushel	8.60
Total	$192.35
Product, 23.5 tons of steel.	
Cost of stock, $ 8.19 for each ton of finished product.	

It will be seen that this cheap stock has given an advantage of $4 per ton over the Pittsburgh district, but this will be overcome to a great extent by the delay in melting the larger quantity of ore and lime, and by the lengthening of the period of oreing due to the unwieldy volume of slag. Taking into

consideration the extra wear of the hearth with consequent repairs, and the reduced capacity of the furnace when large quantities of slag are produced, it is probable that a plant will not make much more than half as much steel in a year under this practice as it would if the charge were made up of good pig iron mixed with sufficient scrap, and this is equivalent to saying that the cost of fuel and repairs will be doubled; the skilled labor per ton will be much increased on account of the decreased product, while the common labor keeps pace with the extra stock and slag to be handled. The above calculation assumes that the pig iron is cast in chills so as to be free from sand or is put into the furnace when melted, for if it is cast in sand the waste and the volume of slag will be enormously increased. It also calls for the use of pure lime and for rich ores, the latter probably requiring transportation from Lake Superior, and experience will prove that specifications are in the line of true economy.

The contents of silicon and sulphur are not what might be wished, but they are fully as low, when considered together, as can regularly be made by the average furnaceman from the silicious ores and the sulphurous, weak, and silicious cokes of Alabama. The difficulty of making low silicon, low sulphur irons in this region has been recognized by all metallurgists, and various projects have been pushed forward whereby irons high in silicon could be handled, it being assumed that if sufficient leeway is given in this element the sulphur can be eliminated by a hot-working blast-furnace. The most attractive method is what is known as the duplex process, by which the silicon is removed in a converter and the metal then transferred to a basic open-hearth for the elimination of phosphorus. That this is a comprehensive and perfectly feasible system cannot be denied, but in the opinion of most steel makers the expense of the operation will be prohibitory. A careful calculation of the waste and scrap in Bessemerizing and reworking, and a consideration of the incidental expenses incident to such a complex plant, render the installation of such an outfit more attractive to the constructive contractor than to the investor.

ACTION OF FURNACE GASES ON IRON ORES.

At the recent Denver meeting of the American Institute of Mining Engineers, a paper on the above subject was ready by Mr. O. O. Laudig, chemist of the Buffalo Furnace Co., Buffalo, N. Y. Reference to the experiments detailed in the paper was made in a communication to *The Iron Trade Review* of April 23, this year, by F. E. Bachman, manager of the Buffalo Furnace Co. The experiments appear to have been undertaken to throw some light on conditions affecting the reducibility of various ores. It was apparently the expectation, also, that something would be added to the information available as to any relation that may exist between top explosions and the use of comminuted ores. Mr. Laudig does not touch upon this latter matter, however, though Mr. Bachman in the communication referred to above, advanced the theory that excessive carbon deposit is the cause of explosions in furnaces using Mesabi ores.

Mr. Laudig's paper says that the ores selected for his experiments were representative ores from the Mesabi, Marquette, Menominee, Gogebic and Vermilion ranges, also from Southwest Virginia. To these ores were added several samples of scales and cinders.

To find the oxygen loss of the various ores by heating, a ½-gramme sample of each was weighed into a porcelain combustion boat 1½ inches long, and all being placed in a cylindrical reservoir, the apparatus was sealed and immersed in a lead bath. Air which was passed through caustic potash, pyrogallate of potash and concentrated sulphuric acid was then forced for three hours through a ⅛-inch pipe into the reservoir.

The ores did not increase in bulk, but on the contrary occupied less space than before heating.

The next experiment was with furnace gases. Two watertight barrels were used to collect the gases, which were drawn from the furnace at 10 feet below the stock-line. These gases were passed over the ores for 2¼ hours. Upon opening the apparatus after it had cooled, it was found that a number of the ores had increased in bulk, and had deposited so much carbon as to almost completely fill the porcelain boat, a bulk equal to four or five times that of the original sample. The porcelain boats and contents were then weighed, thus giving the weight of ore and carbon deposited after treatment with gas. After determining the carbon its weight was deducted from the above, and, this result being taken from the original weight of the sample, the loss during the treatment with furnace-gas was obtained. From this loss was deducted the loss (in weight) in the preliminary heating, thus giving the weight of oxygen lost for ½ gramme of sample used. The percentage of oxygen lost was then calculated, based on its combination with metallic iron.

Great pains was taken in crushing and sieving the ores, to prepare them for the experiments. The lump samples were crushed so as to pass through a 20-mesh sieve, but only the part remaining on an 80-mesh sieve was taken. The finest ores were crushed through a 100-mesh sieve. Care was taken to sieve repeatedly so as to have the least possible quantity pass through the smaller meshed sieves. The object of the classification was to obtain as nearly as possible a relative size of the ores as shown by natural condition.

In the tables he presents, Mr. Laudig gives data concerning 33 samples that were tested—the class of ore, physical appearance, relative fineness, cohesion, specific gravity, chemical constituents, loss in oxygen, per cent of carbon deposit, etc. From the statement of the results of the experiments we take the following:

"The scales, cinders and magnetites did not change in volume. It was noticed that the ores which deposited the most carbon increased most in volume, probably because of the carbon splitting up the particles and rendering them spongy. The amount of carbon deposited seems, however, to bear no relation to oxygen lost. The size of the grains bears very little relation to the oxygen lost, inasmuch as the coarsest sample of No. 26 [an ore of which three samples were taken] lost as much oxygen as the finest. This will make future experiments easier, as the sieving and classification of ores according to size is a very long and tedious operation.

"In the amount of oxygen lost no distinct line can be drawn either as to class of ore, size or physical appearance, except in the case of magnetic ores, few of which lost any oxygen, several losing none. The hematites seem more easily reduced than the specular ores, yet an almost perfect type of a specular ore lost 28.84 per cent of its oxygen, which is above the average lost by the hematites. Of two dense, massive hematites of about the same chemical composition and specific gravity, one became quite spongy, deposited about eight times as much carbon and lost twice as much of its oxygen as the other. The preliminary sieving of the ores was purely experimental, as nothing definite was known regarding the effect of the size of the grains upon the amount of the oxygen lost. It was, however, thought that the finest ores would reduce easier than the coarsest ones. Reference to the table will show that this was not the case."

Straightening a Chimney Stack.

The accomplishment of a job of this kind by a novel method at the brick and tile works of the Standard Concrete Mfg. Co., Earnest, Pa., under the supervision of B. W. Seamans, the company's superintendent, is described by *Engineering News*. The stack is 122 ft. high, 11 ft. square at the base, tapering somewhat at the top, and weighs 400 tons. The walls are 36 inches thick. The top was found to be leaning 45 inches from a vertical line. To sink the side four and one-half inches, 10 inches of brick work was removed from the foundation on three sides. As the bricks were removed square blocks of wood were inserted one after the other, until three sides of the stack rested on the blocks. Between the blocks, supporting the stack temporarily, substantial brick piers six inches high were built, leaving a space four and one-half inches between the top of the piers and the bottom of the underground brickwork. The blocks were then set on fire and all were kept burning briskly. If one burned faster than the others the fire on that particular block was checked, so that all were made to burn uniformly, and as the blocks were being reduced to ashes the stack slowly righted. As the top gradually swung back through the 45-inch arc small fissures appeared near the base. Into every crevice a steel wedge was driven, maintaining the solidity of the walls. The work consumed one day, and the reduction of the wooden blocks to ashes required an hour.

Whenever you contemplate making any particular use of exhaust steam, either for heating water, for heating buildings, for use in any kind of heating systems, or for any purpose when condensed, it will undoubtedly pay you to devote a little time to investigating appliances that will thoroughly remove the cylinder oil from your exhaust steam.

The principal reason for our calling your attention to this matter hinges on the fact that we make appliances for purifying exhaust steam of exceedingly high efficiency. In other words, we can so effectively remove oil from exhaust steam that this steam by actual contact can be safely used for heating water for boiler feed and other purposes, or used for similar purposes when condensed.

Almost One Thousand (1000) of the COCHRANE SEPARATORS are now in use—most all of them have been sold by "One man telling another, making known their fame." "Our light has not been hidden under a bushel," for we number among our customers, in this one specialty, many of the largest concerns in the country.

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INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Wiard Foundry Co., of Brooklyn, N. Y., has been incorporated with $10,000 capital. The directors are: Matthew Wiard and William N. Calder, of New York, and William J. Serrell, of Bayonne, N. J.

Frank Mossberg, formerly of the Mossberg Mfg. Co., has reorganized the company with a capitalization of $700,000, under the name of Mossberg & Granville Mfg. Co. The manufacturing facilities will be largely increased. It is intended to erect a factory large enough to accommodate 500 operators. The principal products will be a full line of rolling mills, punching and stamping machines. A special department will be fitted up for the manufacture of the Mossberg roller bearings on a large scale.

The Plummer Mfg. Co., of St. Louis, Mo., has been incorporated with $15,000 capital, to manufacture machinery. Wm. S. Plummer and Jos. F. Wangler are the chief stockholders.

The Wright Mfg. Co. has been incorporated at Chicago, with a capital stock of $10,000, to manufacture bicycles, electric apparatus, etc.; incorporators, Alfred E. Manning, Charles M. McLaren, and Josiah Cratty.

United States Malleable Iron & Steel Co. has been incorporated at Chicago, with a capital stock of 100,000; incorporators, Henry H. Blake, Frank J. Kilcrane, and Manuel Friendlander.

The Edwards Car Coupler Co., of Troy, N. Y., has been incorporated, with a capital of $500,000, to manufacture mechanical devices of all kinds for use in connection with locomotives, cars and vehicles propelled by steam, electricity or other motive power. The directors are: Richard J. Edwards, of Galena, Ill.; Charles E. Lewis, of Philadelphia; Charles H. Wallow, John A. MacDonald, of Troy; Morton A. Moldridge and Lyman P. Wood of Green Island.

The Gebhardt Chili Powder Co., New Braunfels, Texas, wants to get in communication with makers of grinding and cutting machinery.

At Macon, Ga., Messrs. Hopper and Chas. Scheell have started an iron foundry for light castings and machinery repairing.

Hill, Lloyd & Co., Knoxville, Tenn., will put in machinery for the manufacture of tinware.

C. S. Ashbrook, Louisville, Ky., will buy machinery for making machine and carriage bolts.

Col. M. H. Crump, Lyndon, Ky., is in the market for a forge, molding machine and drawing tools for a manual training school.

New Construction:—

The American Foundry & Mfg. Co. will erect a new building in Allegheny, Pa.

Bruce Watson, City Architect of Chicago, is at work on the plans for the new machine shops to be built by the city on Ashland ave., south of Twenty-second st. Three buildings will be constructed on this site. There will be a machine shop two stories high, 80 x 125 feet, and a police department repair shop, two stories high, 75 x 150 feet. These buildings will be constructed of red pressed brick. In addition to this there will be a storage shed of 25 x 150 feet, one story high, constructed of corrugated iron. The buildings will cost approximately $60,000. Contracts for construction will be let in about three weeks.

The new galvanizing department of the National Tube Works, McKeesport, Pa., is about completed.

A shovel works is to be built at Scottdale, Pa.

Hiram, O., calls for new bids for water works construction, those put in Sept. 16 being above the estimate.

The engineer of maintenance of way department of the Pennsylvania Road is now engaged in erecting a large iron viaduct across Ridley Creek, 100 feet high from the water to the rail. The same department is also building an iron bridge on the Frazer branch over Pickering Creek, to replace the old wooden trestle work. These two operations will cost considerably over $100,000.

Part of the structural material for the new Buhl steel mill at Sharon, Pa., is on the ground. The building will be 910 feet long, with two annexes each 150 feet long.

Additions, Enlargements, Removals, Etc:—

The increasing business of the Herreshoff Mfg. Co., Bristol, R. I., necessitates an increase in the plant by the erection of a large building to the southward of the present machine shop. The new building, it is understood, will be used for a machine shop, in which engines are to be constructed, while the upper stories are to be occupied by several branches of the machinery and boiler departments.

It is reported that the Riverside Iron Co., at Benwood, W. Va., will build butt weld furnaces at its tube works.

The Whitaker Iron Works, at Wheeling, are being enlarged by the erection of new puddilng furnaces.

Fires and Accidents:

The pattern building of the Bertolette Engine & Machine Co., Norristown, Pa., was destroyed by fire last week, causing a loss in patterns, &c., of $3,000, covered by insurance.

On Sept. 30 the cast house of the Temple Furnace, near Reading, Pa., was blown down by a heavy storm, two men being killed and others seriously injured. At Harrisburg and Steelton considerable damage was done to the roofs of iron and steel works by the storm.

General Industrial Notes:—

Warwick Furnace, at Pottstown, Pa., has blown out for repairs. The furnace made 202,000 tons during the last campaign.

The Western Foundry Co., Chicago, was robbed, Sept. 25, of $1,600 which had just been taken from the bank to meet the pay-roll. The officers of the company were in its office when they were held up by two armed robbers, who seized the

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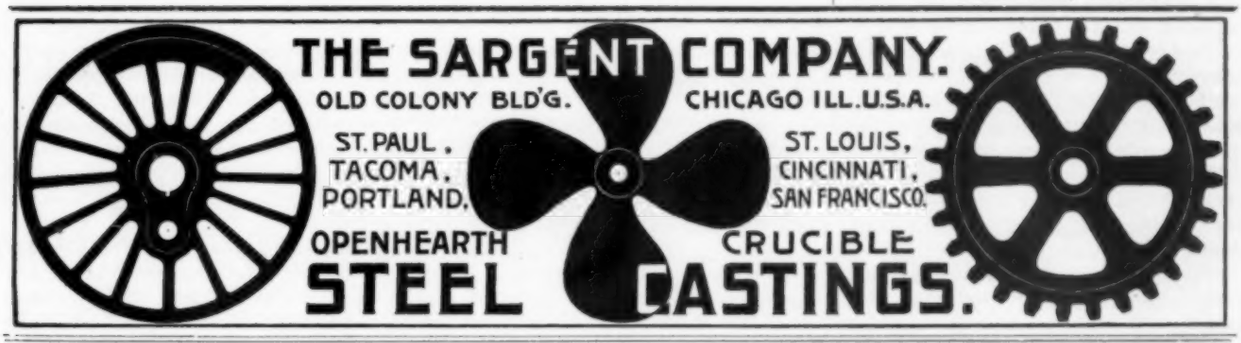

money and made their escape before any effectual resistance could be made.

Riehlé Bros. Testing Machine Co., of Philadelphia, Pa., has shipped to the Sormovo Co., Nijni Novgorod, Russia, a 100,000-pound automatic and autographic testing machine, and also a specimen miller. The company has also placed 200,000-pound testing machines with the Schoen Pressed Steel Co. and Jones & Laughlins of Pittsburgh. It is building a large 300,000-pound wire rope testing machine for John A. Roebling's Sons Co., Trenton, N. J.

The Draper Machine Tool Co., of Worcester, Mass., has started up on full time, after an enforced shut-down for four weeks. The company has recently completed a three-story brick addition, 55 x 65 feet, which will double the capacity of the works.

The Hamilton Machine Tool Co., Hamilton, O., has just completed another large order for drill presses, to be shipped to Stockholm, Sweden.

The Illinois Steel Co. commenced the manufacture of cotton ties at its Milwaukee plant last week. It is expected that a capacity of 2,000 bundles will be attained.

The sale of the property of the Harrisburg Car Mfg. Co., which had been announced to take place at Harrisburg, Pa., on Sept. 22, was indefinitely postponed at the request of the unsecured creditors, who believed that the sale of the property under existing business conditions would not bring a reasonable price.

The Lalance & Grosjean Mfg. Co., Harrisburg, Pa., started this week with one sheet mill and two tin mills, after being idle since the middle of July.

The Hopewell furnace, Berks Co., Pa., which dates back to 1760, has now been dismantled after being idle 10 years.

The Ball Engine Co., Erie, Pa., has taken the contract for Engines for the new library building at Chicago, and the General Electric Co. will furnish the dynamos. The Ball Engine Co. also has the contract for engines—one of 400 and one of 150 h.p.—for an electric lighting equipment for the Shoenberger Steel Co., Pittsburgh.

The American Malleable Iron Works at Latrobe, Pa., were sold at sheriff's sale to Milton I. Baird, of Pittsburgh, for $33,500. The purchaser held a $30,000 mortgage. It is probable the plant will be operated by a new company.

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1—55″ Allen Riveter.
1—24x24x7 ft. New Haven Planer.
1—30x30x8 ft. Harrington Planer.
1—36x36x18 ft. Sellers Planer.
1—36x36x20 ft. N. Y. Steam Engine Co. Planer.
1—16x18″ Lathe & Morse Crank Planer.
2—15″ Hendey Shapers.
1—15″ Youngson Shaper.
1—15″ Smith and Mills Shaper.
1—10″x5′ Prentice Engine Lathe.
1 each 14″ and 15″x6′ Ames Engine Lathe.
1—16x5 ft. Bullard Engine Lathe.
1—18x8 ft. L. W. Pond Engine Lathe.
1—24x8 ft. Phillips Engine Lathe.
1—24x14 ft. Lathe & Morse Engine Lathe.
1—38x14 ft. New Haven Engine Lathe.

AND MANY OTHERS.

We have all the best makes of New Tools. Send for Second-Hand List.

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Rolling Mills, Steel Works, Blast Furnaces Coal and Coke Works, Power Houses for Electric Street Railways, etc., promptly fitted up by Experienced Workmen.

AIKEN Duplex and CRITCHLOW Valves, either three or four way, for operating Mill and Hydraulic Machinery of all kinds under any desired pressure, and Stop Valves for same.

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Puddling mills Nos. 2 and 4 of the National Tube Works, McKeesport, have shut down.

The Leechburg Foundry & Machine Co. and the Anderson Foundry & Machine Co., Anderson, Ind., have settled the issues growing out of the building of a pickling machine by the latter which was considered an infringement on the Leechburg company's patents.

The Carnegie Steel Co., Ltd., has given notice that the present wage scale will expire Jan. 1. The notice is in accordance with the agreement existing between the employes and the company, whereby notice must be given by either the previous Oct. 1 if any change is desired in the wage scale of the following year. It is not known that changes will be made, but the present notice is a necessary form, and the question will be open for adjustment Jan. 1.

The Duquesne Steel Works of the Carnegie Steel Co., Ltd., resumed Monday, after two weeks' idleness. The shut-down was enforced by reason of an explosion which considerably damaged the plant.

Wm. Forgie, of Washington, Pa., will operate the foundry recently purchased from Fink Bros., of the same place, in connection with his original plant.

The Eureka Fire Brick Co., of Dunbar, Pa., has given notice of a reduction of 15 per cent in wages.

The recent building of the Kansas City, Pittsburgh & Gulf Railroad into Polk Co., Ark., and a consequent examination by prospectors connected with the railroad of the manganese deposits in this county, have shown that they are more valuable and extensive than heretofore supposed. A report by the State geologist of Arkansas, made in 1890, discredits the quantity and the quality of these deposits, but a later careful and systematic examination of portions of this district by interested persons leads them to say that instead of the deposits being merely pockets of manganese, beds have been found of the formation, and that veins extending over the county for many miles are traceable by the ordinary prospector; these varying in width from four inches to six feet. Deposits have been found of almost pure mineral, suitable not only for steel making, but for fine glass making also.

A Chester, Pa., dispatch says: "The Russian government is negotiating for the purchase of the machinery of the Wellman Steel Works. The price offered is $36,175, 90 per cent of which is to be paid in cash as soon as the deal is closed. The purchase includes the engines, the largest train of plate rolls in the world, cranes, pumps and all necessary apparatus for putting the plant in immediate operation

The Ætna Foundry & Machine Co., Warren, O., is finishing an order of tin plate machinery for the plant of the Connellsville (Pa.) Sheet & Tin Plate Co. It includes five tin machines, five branners, a polisher and an Ætna pickler and equipment.

Keystone Furnace, near Easton, Pa., owned by the Thomas Iron Co., was put in blast Sept. 22, after being idle for several months.

It is expected that plates will be rolled at the plant of the Ironton Structural Co., at West Duluth, Minn., built originally to roll beams, utilizing the universal beam mill patents of James E. York. It is understood that the York patents will not be experimented with further for the present, and that the first plates rolled will be on a contract for riveted pipe to be laid for a city system of water works. The pipe will be made at the plant of the West Duluth Mfg. Co.

A Superior, Wis., dispatch says: "John D. Rockefeller and bondholders of the embarrassed West Superior Iron & Steel Co. have made a proposition for reorganization of the corporation with new capital to enlarge the industry and otherwise improve it ready for operation. The proposition was made by G. W. Murray, of New York, attorney for Rockefeller and the bondholders, to representatives in this city of all the other interests."

The South Chicago works of the Illinois Steel Co. will close down this week, to remain idle for some time.

The Carrie Furnace Co., Pittsburgh, has posted notice of a 10 per cent reduction in wages, effective Oct. 8. This company some time ago voluntarily advanced wages.

The Bell Island Hematite Iron Mine, near St. John, N. F., employing 300 men, and selling most of its output to the Maryland Steel Co., has closed down for 12 months. The owners cannot dispose of the output because of the depression in American industries. The charters of steamers which have been engaged to carry ore from the mine to the market have been cancelled.

The Pottstown Iron Co. will be taken out of the receiver's hands shortly, as there is money sufficient to pay off all the floating and urgent obligations now at hand.

Business at the works of the Pennsylvania Steel Co., last week, was on a par with that of the previous week. There was but little demand and matters do not brighten much. It

was expected that the Bessemer No. 1 blooming and rail mills, which were idle last week would not run this week.

The Geo. B. Sennett Foundry Co., Youngstown, O., has let a contract to the Enterprise Electric Co. of the same place for an electric light plant for the new Sennett plant. Fifteen arc lights and 50 incandescent lights will be put in at the start.

Changes are being made at the plant of the Consolidated Steel & Wire Co., Cleveland, so that copper wire may be drawn instead of steel wire. The rod mill of the company has remained closed since the strike of the men some months ago.

A number of the directors of the Colorado Fuel & Iron Co. visited the steel works at Pueblo recently. It is reported that plans are on hand for the remodeling of the plant and the introduction of improvements.

The puddlers employed by the Ellis & Lessig Steel & Iron Co., Pottstown, Pa., decided not to accept $2.15 a ton for puddling instead of $2.75. The company intended to start the works, but the action of the puddlers will doubtless prevent this.

Sharon, Pa., advices are that the Thomas D. West foundry resumed operations Oct. 5, and that the Graff Stove Works will be started up this week. The new by-product coke ovens at the Sharon Iron Works have been tested with good success.

The principal work now under way at the General Electric Co.'s plants is repairs, these being of considerable proportions. Much activity in new electric work is expected after the election. The incandescent lamp factory is working full.

Among properties sold at sheriff's sale at Pittsburgh, Oct. 5, was the plant of Graff, Bennett & Co., at Bennett Station. It was sold on a mortgage for $40,000, held by Hay Walker, as trustee for creditors. It was bid in by the trustee for $3,500.

Preparations are making for testing the Westinghouse electric traction system on the elevated roads in New York. The questions whether the electric current could be so perfectly controlled that trains upon an elevated structure could be run, first of all, with the safety which has been characteristic of these roads in the past 15 years, and whether electricity would be as economical as steam, or more so, are believed to have been answered. Tests will be made on one of the smaller branches and afterwards more exhaustive tests on the part of the system north of the Harlem River. A trial made at New York, Monday, on the Manhattan Elevated Railroad was pronounced successful. The system used combines the use of storage batteries and of a third rail charged with the electric current. The third rail is placed just outside one of the wooden beams that serve as a guard to prevent the wheels jumping the rails. It is about four inches above the beam and eight inches above the regular track. The current is supplied from a dynamo, located near by. Two steel shoes take up the electricity from this third rail and carry it to the motor. The running time made is not equal to the steam engines, but this may be due to faults that can be corrected.

Excursions to Dayton, Knights Templar of Ohio.

Oct. 13th and 14th, special excursion tickets will be sold to Dayton, O., from ticket stations on Pennsylvania Lines, for Meeting of Grand Commandery, Knights Templar of Ohio. Return coupons will be valid through to original starting point on or before Oct. 17th.

At the end of September there were in the yards of the American Pig Iron Storage Warrant Co. 184,700 tons of pig iron, 6,600 tons having been put in yard and 9 tons withrawn in the preceding week

Excursions to Pittsburgh Via Pennsylvania Lines.

Oct. 12th, 13th and 14th, from ticket stations more than 200 miles from Pittsburgh, and Oct. 13th and 4th, from ticket stations not exceeding 200 miles from Pittsburgh, special low rate excursion tickets will be sold to Pittsburgh via Pennsylvania Line for Annual Convention of Brotherhood of St. Andrew; return coupons will be valid through to original starting point on or before Oct. 20th.

Secretary Herbert awarded the contracts for two torpedo boats of the 30-knot class to the Bath, Me., Iron Works, and one to the Union Iron Works, San Francisco.

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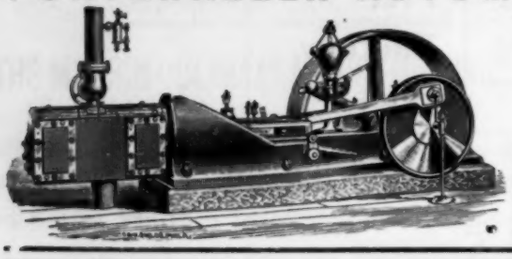

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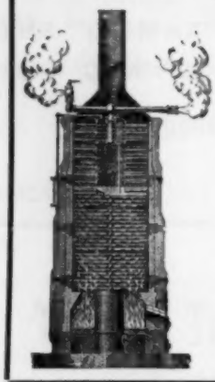

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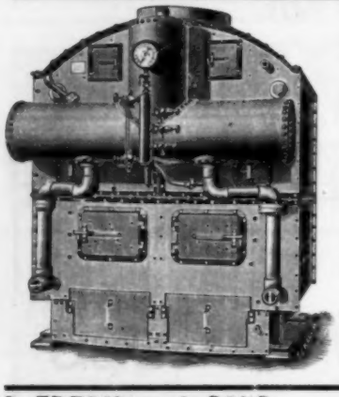

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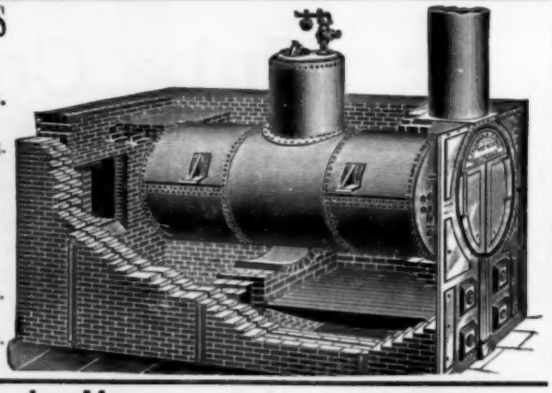

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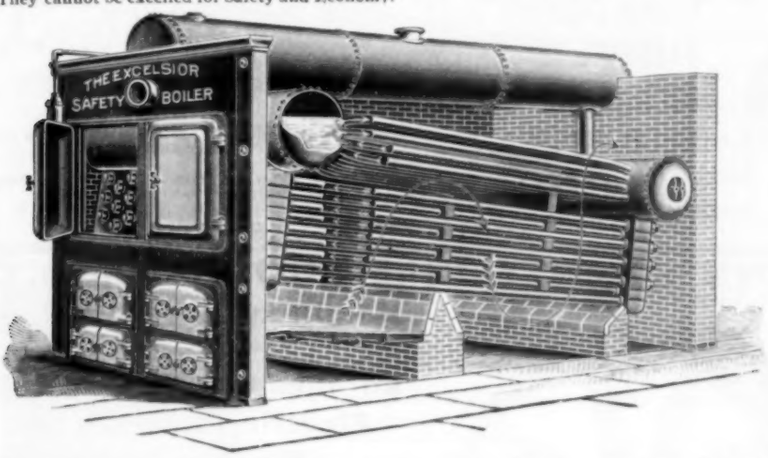

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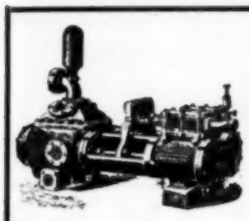

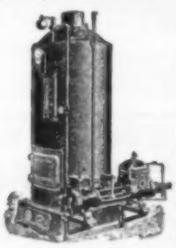

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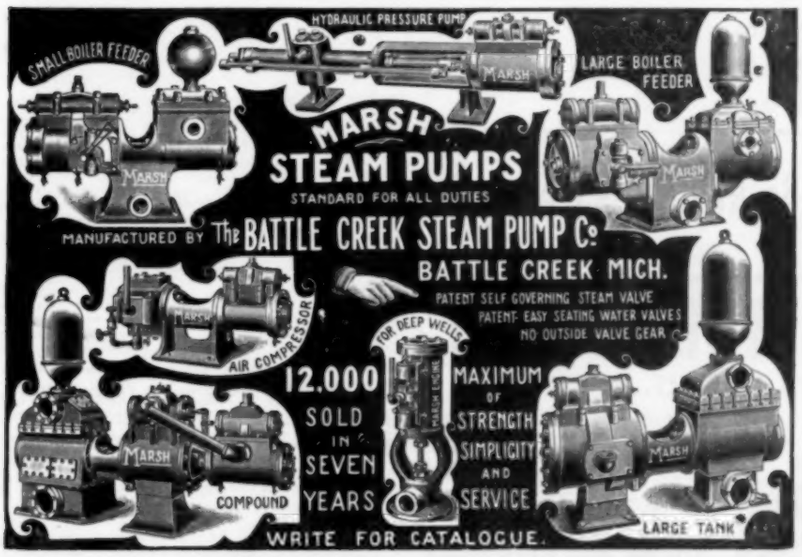

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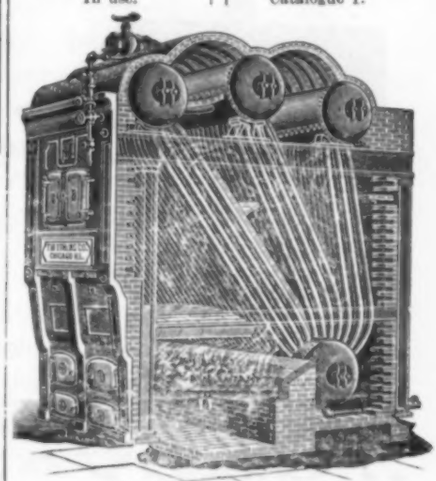

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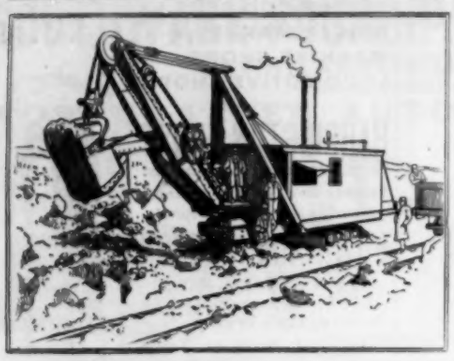

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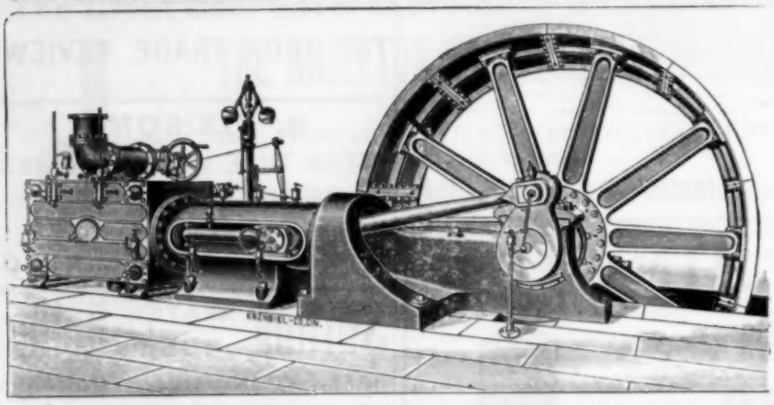

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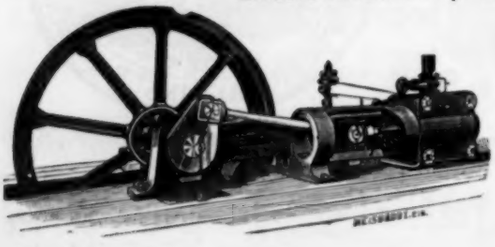

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* Daily. † Daily, except Sunday.

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Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:30 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	* 5:45 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

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Valley Jctn. & Way Stations	*6:30 P M	*7:10 A M
Akron, Canton & Valley	*10:10 A M	*3:15 P M
Akron, Canton & Chicago	*8:10 A M	*6:30 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

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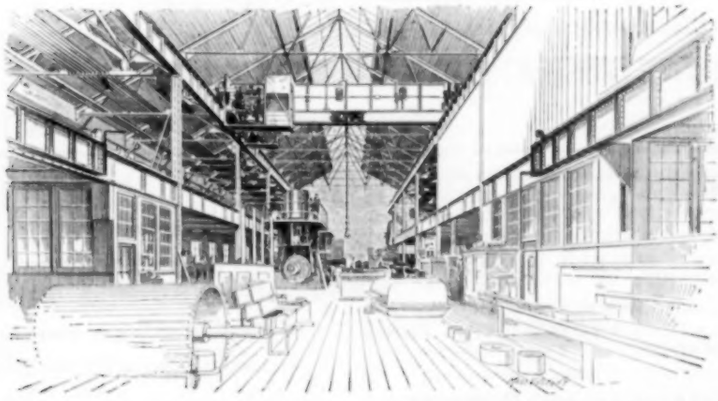

The above illustration is taken direct from a photograph and shows the interior of a Machine Shop designed and built by us for the J. Morton Poole Co., at Wilmington, Del. The building is 87 feet in width by 137 feet in length. The central portion of the building is 36 feet in width and of sufficient height to set up heavy marine engines under the traveling cranes.

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STAMPING WORKS,
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WIRE-ROD AND WIRE MILLS,
WIRE-NAIL WORKS,
IRON AND STEEL BRIDGE-BUILDERS,
IRON AND STEEL SHIP-BUILDERS,
HORSE-NAIL WORKS,
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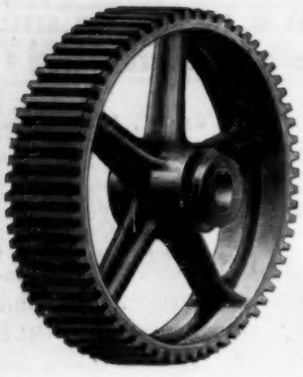

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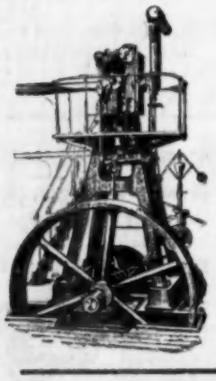

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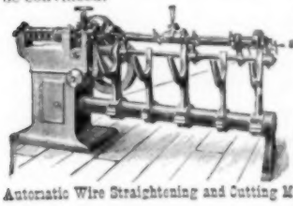

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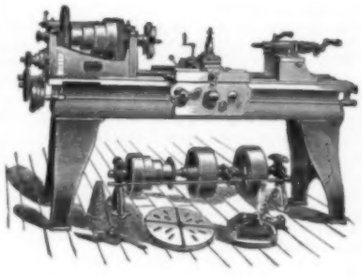

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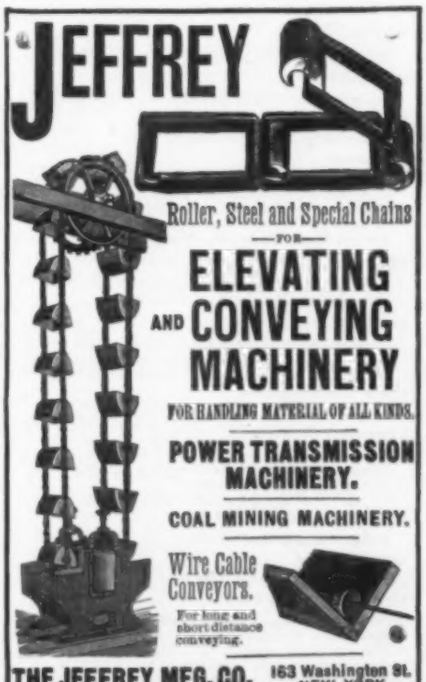

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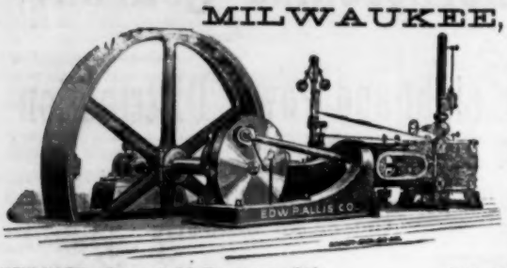

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Adt & Son, John	27
†Addyston Pipe & Steel Co	—
Ætna-Standard Iron & Steel Co	32
Aitchison, Rob't Perforated Metal Co	31
Allis & Co., Edward P	30
Allison Coupon Co	33
Almy Water Tube Boiler Co	22
Atlanta Steel & Tin Plate Co	2
Atwood & M'Caffrey	18
Bacon, Earle C	19
Baird Machinery Co	18
Battle Creek Steam Pump Co	23
Berlin Iron Bridge Co	25
Besly & Co., C. H	36
Bethlehem Iron Co	35
*Berger Mfg. Co	20
*Bertsch & Co	20
Bickford, H	36
Bourne-Fuller Co	22
Brass Founders Supply Co	25
Brightman Furnace Co	36
Bowes, F. K	19
Brown, Edward	35
Brown Hoisting & Conveying Machine Co	19
Bucyrus Steam Shovel & Dredge Co	24
Buffalo Forge Co	1
Cady Mfg. Co	31
Cambria Iron Co	33
Central Iron & Steel Co	35
Chicago Heights Land Ass'n	21
Chicago House Wrecking Co	27
†Chicago & Northwestern Ry	—
Channon & Co., H	36
Church, Isaac	35
Cincinnati Corrugating Co	2
Claflen Mfg. Co	36
Clearfield Fire Brick Co	35
Cleveland & Buffalo Transit Co	22
Cleveland City Forge & Iron Co	1
Cleveland Electrotype Co	35
*Cleveland Galvanizing Works	24
Cleveland Rolling Mill Co	35
Clinton Iron & Steel Co	27
*Clonbrock Steam Boiler Co	20
Coffman Coke Co., W. H	32
*C. M. & St. P. Ry	20
Cole, J. Wendell	36
Collins & Co., H. E	1
Coshocton Foundry Co	1
Deming Co	23
Detroit & Cleveland Steam Navigation Co	35
*Diamond Machine Co	—
Dickman & MacKenzie	1
Dixon, Jos. Crucible Co	27
Dover Fire Brick Co	35
East Chicago Foundry Co	17
Emmerton, F. A	2
Finished Steel Co	19
*Fix Sons	23
Fleharty, J. H. & Co	2
Forster, Waterbury & Co	1
Fraser & Chalmers	26
*Freeman & Sons, S	22
*Fulton Steam Boiler Wks. & Fdy. Co	22
General Electric Co	26
†Garden City Sand Co	—
Gerlach, Peter & Co	22
Gobeille Pattern Co	1
*Haeseler & Co	20
Harrington & King Perforating Co	34
Harrington, Son & Co., Edwin	23
Harrison Safety Boiler Works	16
Hartford Steam Boiler Insp. & Ins. Co	23
Hazelton Boiler Co	22
Hooven, Owens & Rentschler Co	24
Hunt & Co., Robert W	2
Illinois Central R. R	34
Illinois Screw Co	1
International Correspondence School	19
Iron Clad Paint Co	31
Jeffrey Mfg. Co	27
Jenkins Bros	32
Jessop & Sons, Ltd., Wm	27
Jones Foundry Co., W. A	1
Junction Iron & Steel Co	2
Kellogg Weldless Tube Co	21
†Kelly & Co	—
Lane & Bodley	24
Lloyd Booth Co	34
*Lodge & Shipley Machine Tool Co	36
Marine Iron Works	19
Marion Steam Shovel Co	35
McDowell Steel Co	35
Meehan Boiler Co	23
Moore Mfg. Co	1
Morton Tin Plate Co	22
†National Jeloluse Co	—
Newell Bros	1
†Newport Sand Bank Co	—
Norman Co., J. J	2
North American Metaline Co	36
Nuttall Co., The R. D	26
Oglebay, Norton & Co	26
Ohio Sand Co	36
Otto Gas Engine Co	31
†Phœnix Iron Works Co	—
Pittman, C. K	2
Pollock, Wm. B. & Co	2
Playford Stoker Co	2
Pope, E. C	22
Prouty Co., The	2
Q. & C. Co	36
Rand Drill Co	2
Rippel Mfg. Co	1
Reese, Hammond & Co	36
Roberts Steel Chain Belting Co	32
Rockwell & Co., W. S	25
Sargent Co., The	17
‖Sharon Fire Brick Works	1
Sharpless & Winchell	36
Shiffler Bridge Co	33
Southwark Foundry & Machine Co	22
Star Dynamo Co	31
Sterling Emery Wheel Mfg. Co	34
Stirling Co	23
Stevens, F. B	36
Stowe, Fuller & Co	17
Stuart Fire Brick Co	32
Sturtevant Co., B. F	2
Sykes Iron Roofing Co	24
Taylor & Boggis Foundry Co	1
Textor, O	2
Tod, Wm. & Co	34
Toledo Machine & Tool Co	35
Translucent Fabric Co	25
Union Mining Co	17
Upson Nut Co	1–2
Westinghouse Electric & Mfg. Co	29
*Williams Mfg. Co	—
Westmoreland Fire Brick Co	31
*Wormer Machinery Co	—
Worthington, Henry R	23
Wright Co	27
Wellman Seaver Engineering Co	36

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Local Scotch Foundry No. 3	10 25@ 10 75
Southern Coke No. 1	11 15@ 11 40
Southern Coke No. 2	10 90@ 11 15
Southern Coke No. 3	10 65@ 10 90
Southern No. 1 Soft	10 90@ 11 15
Southern No. 2 Soft	10 65@ 10 90
Southern Silveries No. 1	11 15@ 11 65
Southern Silveries No. 2	10 90@ 11 15
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Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	13 00@ 13 25
Jackson County Silvery No 1	14 00@ 14 50
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" Mottled	... ... 9 00
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Tennessee " "	14 00@ 15 00
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1½ to 6 by ⅜ to 1 inch	1 35
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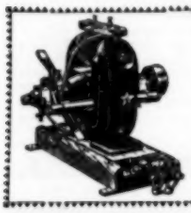
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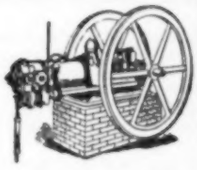

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1 to 1⅞ inch	1 10
2 to 2⅝ inch	1 90
2¾ to 3¾ inch	1 85
3⅞ to 4 inch	1 60
4¼ to 4½ inch	2 30
4¾ to 5 inch	2 40

Oval.

⅜ to 1¼ inch	1 30
⅝ to ¾ inch	1 30
½	1 50
⅞	1 70

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1¼ to 3 inch	1 65
⅜ to 1¼ inch	1 45
⅝ to ¾ inch	1 70
½	1 85
⅞	2 90

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1¼ to 6 by ¼ and 5-16 inch	1 20
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¾ to ⅞ by ¼ and 5-16 inch	1 35
⅛ to ⅝ by ¼ and 5-16 inch	1 60

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1⅛ to 1⅜, No. 13, 14 and 15	1 40
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1⅛ to 1⅜, No 19 and 20	1 50
1⅛ to 1⅜, No. 21	1 60
1⅛ to 1⅜, No. 22	1 70
15-16 and 1 inch, No. 13, 14 and 15	1 35
15-16 and 1 inch, No. 16, 17 and 18	1 50
15-16 and 1 inch, No. 19 and 20	1 60
15-16 and 1 inch, No. 21	1 70
15-16 and 1 inch, No. 22	1 80
⅞, No. 13, 14 and 15	1 60
⅞, No. 16, 17 and 18	1 70
⅞, No. 19 and 20	1 80
⅞, No. 21	1 90
⅞, No. 22	2 00
13-16, No. 13, 14 and 15	1 70
13-16, No. 16, 17 and 18	1 80
13-16, No. 19 and 20	1 90
13-16, No. 21	2 00
13-16, No. 22	2 10
¾, No. 13, 14 and 15	1 80
¾, No. 16, 17 and 18	1 95
¾, No. 19 and 20	2 05
¾, No. 21	2 15
¾, No. 22	2 25
11-16, No. 13, 14 and 15	2 05
11-16, No. 16, 17 and 18	2 10
11-16, No. 19 and 20	2 20
11-16, No. 21	2 30
11-16, No. 22	2 40
11-16, No. 23	2 50
⅝, No. 13, and 15	2 10
⅝, No. 16, 17 and 18	2 20
⅝, No. 19 and 20	2 30
⅝, No. 21	2 40
⅝, No. 22	2 50
⅝, No. 23	2 60
9-16, No. 13, 14 and 15	2 30
9-16, No. 16, 17 and 18	2 40
9-16, No. and 20	2 50
9-16, No. and	1 60
9-16, No. 221	2 70
9-16, No. 22	1 80
7-16 and ½ inch, No. 13, 14 and 15	3 50
7-16 and ½ inch, No. 16, 17 and 18	2 60
7-16 and ½ inch, No. 19 and 20	2 70
7-16 and ½ inch, No. 21	2 80
7-16 and ½ inch, No. 22	2 90
7-16 and ½ inch, No. 23	3 00
⅜, No. 13, 14 and 15	3 00
⅜, No. 16, 17 and 18	3 10
⅜, No. 19 and 20	3 20
⅜, No. 21	4 50
⅜, No. 22	3 60
⅜, No. 23	3 75

Light Band.

1⅛ to 6 by ⅛ to 3-16 inch	1 60
1⅛ to 6 by Nos. 11 and 12	1 65
1 to 1⅜ by ⅛ to 3-16 inch	1 65
1 to 1⅜ by Nos. 11 and 12	1
⅞ and 13-16 by ⅛ to 3-16 inch	1
⅞ and 13-16 by Nos. 11 and 12	1 75
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅝ inch, beveled edge, by Nos. 11 and 12	1 50
⅝ inch, " " " " 13 and 14	1 60
¾ inch, " " " " 11 and 12	1 65
¾ inch, " " " " 13 and 14	1 75

Sheet Iron.

No. 10	1 40
No. 12	1 50
No. 14	1 60
No. 15-17	1 70
No. 18	1 85
No. 20	2 00
No. 22-24	2 10
No. 25.26	2 20
No. 27	2 30

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 30
Shell	1 40
Flange	1 50
Marine Flange	1 80
Fire Box	2 25

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1¼c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08

Soft Steel Bars, Light

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Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00.494		

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3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
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JENKINS BROTHERS, NEW YORK, PHILADELPHIA, CHICAGO, BOSTON.

7-16 to ⅜ and 2⅜ to 3 in.	.09
3½ to 4 in.	.09½
½ to 11-16 and 4¼	.10
¾ to 6 in.	.10½
¾ to 9-32 and 6¼ to 7 in.	.11
7 in	.13

Flats.

	cts. lbs
2 to 9-16 in. wide by 2 to ⅜ thick	.8

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 50
Open-hearth Tire	"	1 50
Open-hearth Spring	"	1 70
Sleigh Shoe	"	1 55
Toe Calk	"	1 65
Cutter Shoes, tapered and bent	"	1 70

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

⅛, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ⅛, ⅝, 11-16 and ¾ inch diam	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 65
Butt " " "	dis.
Lap " galv. "	dis. 52½
Butt " " "	dis. 50
Boiler tubes 2¼" and smaller	dis. 62½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

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Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 30
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 60&10
Morse Taper and Straight Shank to 1⅛"	dis 60&10
Morse Taper and Straight Shank Larger than 1⅛"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

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	No. 4 to No. 54 46 gr.	150 gr.	Flour F.	C. F.
Kegs, ℔ lb	4¼c	5 c	2¼c	
½ kegs ℔ lb	4¼c	5¼c	2¼c	
¼ kegs ℔ lb	5 c	5¼c	3 c	
10 lb cans, 10 in case	6 c	6¼c	5 c	
10 lb cans less than 10	10 c	10 c	7½c	

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Norton's ..... dis 60@70
Grant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@75
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 35
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 60@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs 12c
" " " " over 5 lbs 10c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	⅜	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3⅝	3⅛
Hexagon	15⅝	11⅛	8⅛	6	5⅝	5⅛	
Washers	9	8	7	5	4⅝	4⅛	4⅛

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ℔ keg card rate
{ Car lots $2.55
{ Less than car lots ... $2.65

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 50
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block ..... dis 20

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in. ..... dis 35
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 4c
Copper ..... dis 4c
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75& 5
" " Nos. 27@36 ..... dis 75&10& 5
Coppered Nos. 0 to 18, market list ..... dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis65& 5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 30

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&15
Agricultural ..... dis 75&15
Mechanic's ..... dis 55&10& 0
Bemis & Call's Combination ..... dis 30
Donohue's Engineers ..... dis 20&15
Lamson & Sessions Engineers ..... dis 65
Billings & Spencer's Drop Forged ..... dis 35
William's " " ..... dis 20
Alligator " " ..... dis 40

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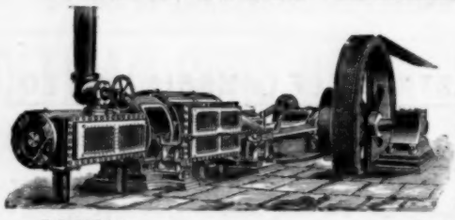

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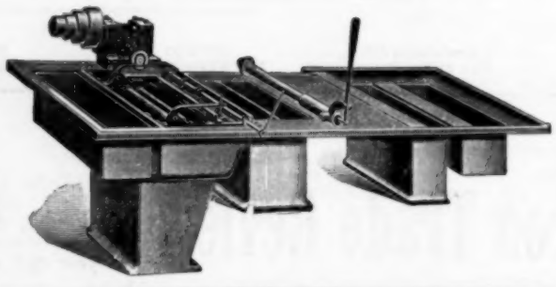

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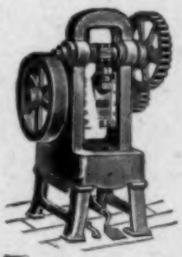

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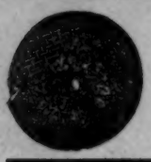

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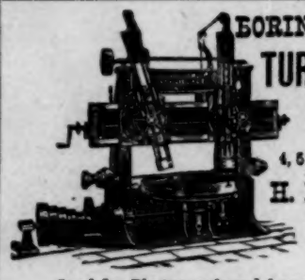

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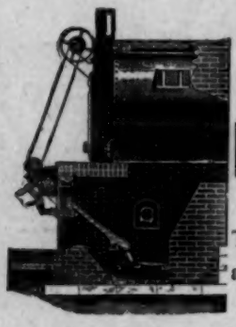

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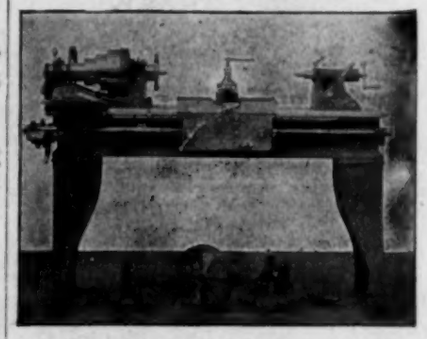

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